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A CASE OF AUTOMATIC DRAWING.

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'AUTOMATISMS' have recently been made a frequent topic of investigation by psychologists, and although the exact reason why some persons have them and others do not remains as little explained as does the precise character and content which they may affect in a given individual, yet we are now so well acquainted with their variety that we can class them under familiar types.

The rudiment of all the motor-automatisms seems to be the tendency of our muscles to act out any performance of which we may think. They do so without deliberate intention, and often without awareness on our part, as where one swings a ring by a thread in a glass and finds that it strikes the number of times of which we think; or as when we play the willing game, and, laying our hands on the blindfolded 'percipient,' involuntarily guide him by our checking or encouraging pressure until he lays his hands upon the object which is hid.

The next higher grade of motor automatism, involving considerable subconscious action of intelligence, is found in the various alphabet-using forms of amateur mediumship, such as table tipping, the 'Ouija-board,' and certain other devices for making our muscles leaky and liable to escape from control.

'Graphic' automatisms, of which planchette-writing is the most popularly known example, is a more widespread accomplishment than ordinary people think. We have no statistics, but I am inclined to suspect that in twenty persons taken at random an automatic writer of some degree can always be found.

The messages are often elaborate, and surprise the writer quite as much as they do the bystanders by their content. The upper consciousness seems sometimes to cooperate in a faint way, sometimes merely to permit, and sometimes to be entirely ignorant of what the hand is doing. Occasionally the subject grows abstracted, and may go into a sort of reverie or trance if the writing or drawing is prolonged. Sometimes, but apparently in a minority of cases, the hand becomes insensible to pricking and pinching. Of the matters set down and their peculiarities I will say nothing here, these words of mine being merely introductory to a case of automatic drawing which may be interesting to the general reader from its lack of complication and its oddity.

The subject, C. H. P., married, fifty years old, made his living as a bookkeeper until the autumn of 1901, when he fractured his spine in an elevator accident. Since the accident he has been incapable of carrying on his former occupation.

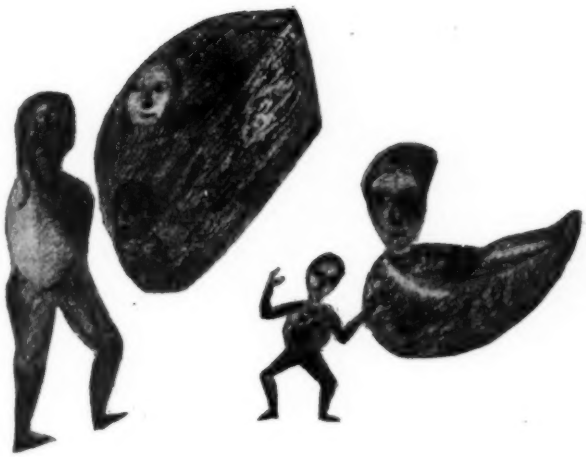
For several years previous to the accident, automatic hand-movements, twitchings, etc., had occurred, but having no familiarity with automatic phenomena Mr. P. thought they were mere 'nervousness,' and discouraged them. He thinks that 'drawing' would have come earlier had he understood the premonitory symptoms and taken a pencil into his hand.

The hand movements grew more marked a few months after the elevator accident, but the subject sees no definite reason for ascribing to the accident any part in their production.

They were converted into definite movements of drawing by an exhibition which he witnessed in February, 1903. The account which follows is in Mr. P.'s own words.

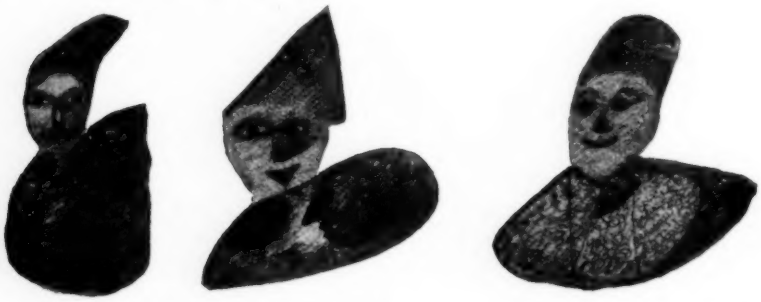
A friend who was interested in hypnotism introduced me to a man who had some power as a hypnotist, and this man gave for our amusement a sample of automatic drawing, a man's face in dotted outline, no shading or detail.

The movement of his hand reminded me of the way my own hand frequently acted, so the next day I sat down to a table with a pencil and paper, and tracings were directly made; but it was some days before I made an object that could be recognized, and I have never made dotted outlines like the man who



performed before me. For some days the movements were violent, and the traces left by the pencil were erratic, the lines being drawn with seemingly no aim, but finally rude forms of objects were executed.

Gradually my hand moved with more regularity and the pictures produced became interesting. Among these were dark-skinned savages, animals and vases of ancient type usually ornamented fantastically with curious faces.



A large proportion of the drawings were human heads, at first very crude in design and execution.

In the course of about two months the pictures assumed an artistic appearance, especially the heads. Most of the heads were quite small and dim in outline and detail.

My hand executed these without volition or direction from my natural self. My mind directed neither the design nor the execution. A new power usurped for the time being the functions of my natural or every-day mind. This power directed the entire performance.

Many times I tried to produce pictures of familiar faces, or scenes familiar to me by long association. I could produce nothing in this direction, but confusion was the result of the attempt. My hand continued to be guided by the unknown power. Weird, fantastic pictures were produced in abundance, many of them artistic in execution, but mostly of ancient type.

Sometimes the face would be so covered with strange devices as scarcely to be recognized as being intended for a face. Frequently a rock would be drawn with faces hewn in it.

While drawing these pictures I became drowsy, so much so that after finishing an artistic one I would sometimes go into an hypnotic sleep, and always would, after a long sitting, if I did not combat the influence.

My pencil moved sometimes so rapidly as to make it difficult to follow it with my eye. At other times it moved slowly. Some of the best effects were produced by rapid movements. I never knew what my pencil would make

when it commenced, and often did not know until finished. Sometimes a design would be entirely changed.

Small pictures were frequently produced by a few rapid movements of the pencil from side to side, the pencil apparently not being lifted, yet the features of the face and general contour of the subject in hand would appear plainly. Voluntary suggestion has little effect on the drawings. After repeated suggestions I have sometimes been able to obtain an allegorical picture, as for instance when I asked for a message from my son, who resided at a distance, a carrier pigeon, having a ribbon around its neck with a letter attached, was produced.

I have tried hard to account for the power or directing mind that produces these pictures, but so far with no satisfactory result. I must say, however, that evidence to me is strong that, in order that the unknown power should have sway, the natural or earthly mind must be for the time being set aside, either entirely, or (what seems to me more reasonable) the unknown power is for the time being the dominant one, but acts in conjunction with the earthly mind. Although while drawing I feel more or less drowsy, my senses seem in some respects to be very keen. To my eyes the pictures usually appear highly exaggerated in beauty as well as in distinctness.

So much is this the case that on the completion of a picture and having taken it up to examine it, the distinctness and beauty which were so apparent while drawing, have departed. Frequently, while drawing, the picture will be illuminated by delicate colors; and a feeling of great disappointment occurs when, on the completion of the picture, I find that not only the colors have disappeared, but the fine points of the picture also.

One strong feeling is left in my mind that whatever directs the pencil is all-powerful, and that nothing is too difficult for its performance if it only chooses to assert its power.

I ought to add that the style of design which my hand draws is strange to me. I have never observed anything like them anywhere. Neither do I know of any influence, suggestive or otherwise, that could have given me this power, with the exception (as I have stated) of having seen a man make a slight exhibition of automatic drawing, but this exhibition was long after I had noticed movements of my own hand. However, that exhibition gave me the idea of taking a pencil into my hand to try for results.

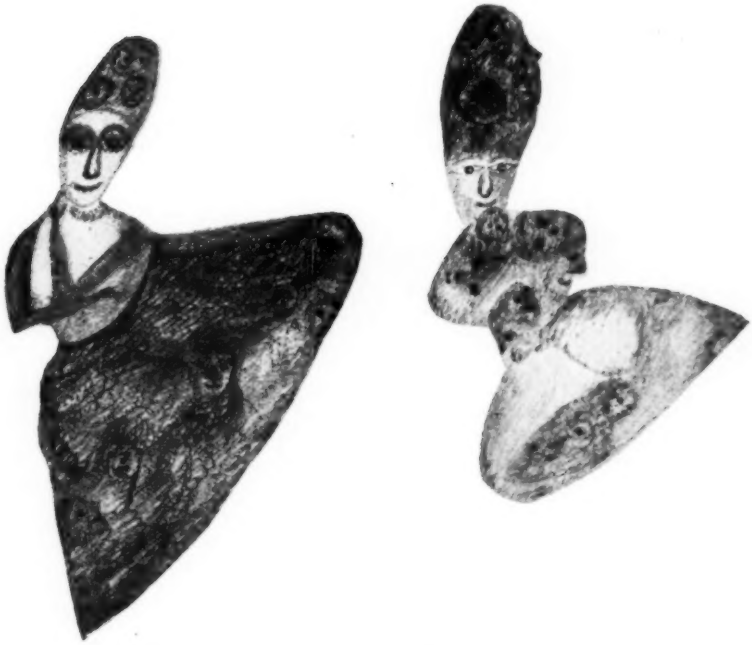
One point I might state clearly. While drawing, my eyes are fastened intently on the point of the pencil in contact with the paper, following the course of the pencil as if they were fascinated by it.

Of automatic *writing* I have done little. Occasionally the name of a near relative will appear, sometimes with figures attached. Sometimes an incoherent sentence will be commenced, but not finished. The name and figures usually appear either on a face or under or over it. Occasionally a word or

line is written in (as I suppose) some ancient language, under or close to a drawing. I have never been able to discover what language this is. Perhaps it is, like the drawings, imperfect.

I had never been interested in hypnotism or kindred subjects before, nor ever attended any meetings or exhibitions in these lines, having always had a disbelief in anything of the kind.

P. S. Three months having elapsed since writing the above, I have but little to add in explanation. Pictures are still produced by the same mysterious power. The artistic appearance is better and the human form is more in evidence. I still think the drawings come from involuntary suggestion, that is, suggestion from the inner mind. Perhaps it would be better to call it impulse rather than suggestion.



I saw Mr. P. make one drawing. His hand on that occasion moved very slowly in small circles, not leaving the paper till the drawing had, as it were, thickened itself up. He seemed to grow very abstracted before the close of the performance, but on testing his hand with a needle, it showed no anesthesia.

It is evident that with a little more system, a little more handwriting, and possibly some speaking under 'control,' this gentleman (whose narrative seems absolutely sincere) would exemplify a case of mediumship of what one might call the 'Martian' type. It would then remind one somewhat of the case so admirably studied by Professor Flournoy in his book 'From India to the Planet Mars.' As the case stands, it is peculiar only for the monotony and oddity of the designs drawn by the hand. As in many other cases, we have no means of guessing why the subject in his drawings follows so peculiar a type. His own statement that he never saw anything like them before, must be taken with a grain of salt; for memories which have lapsed entirely from the upper consciousness of a subject have again and again been proved to actuate his hand in automatic writing. This case may be one of such a memory simply developing and confirming its habits. It may possibly on the other hand be the expression of a 'secondary personality' of some sort, in which (or in whom), if we could make exploration, a systematic context of ideas would be found.

THE COLLEGE COURSE.

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MUCH of the discussion respecting utility of college training is irrelevant, for success in life proves nothing on one side or the other. Every observing man knows that the qualities on which success depends are inborn. College instructors can not impart brains or common sense, can not convert the sluggard into a model of industry; can do little toward removing the vanity which resents advice. They can make only an honest effort to cultivate the material provided by nature.

The discussion has been too nearly academic, and the parties have been wary of coming down to definite issues. The opponent of college training is cautious about too detailed attack upon that with which he is not familiar; while teachers, though united in defense of their work, are not wholly agreed either as to its final purpose or as to the method of attaining it. The lack of consensus respecting the meaning of the term education, whether preparatory or collegiate, is a weakness which opponents have been quick to see and to attack. The purpose in mental training should be as definite as is that in physical training. The latter is a new branch of educational work and the instructors, fettered by no traditions, aim to make the man physically good all around, without any reference whatever to his future calling. In mental training there seems to be no longer any such clear-cut purpose. All agree, of course, in the abstract proposition that the aim is to make the man useful—but, for what?

The medieval theory of education looked to the utilization of the individual for himself. Education being for the privileged few, to fit men for the proper enjoyment of leisure, for the Latin priesthood or to expound Roman law, the relations and the duties of the few to the many were ignored. There resulted a narrow curriculum with close attention to detail, which gave accuracy, certainly very wonderful, but, like that of the microscope, in a very limited field. The modern theory, developing slowly after men were emancipated from the thraldom of the church, more rapidly after the study of nature by observation was born again, regarded the individual not as the whole, but as part of the whole, recognizing the basal principle that 'No man liveth unto himself.' It demanded that man be so trained as to be of the

utmost use not to himself only, but to his fellows also. It asserted that a man must earn the right to live by being of service, and denied that training along the prevalent narrow lines was education in the proper sense. It ridiculed the pretensions of a system which boasted of its success in producing men whose scholarship was proved by volumes filled with quotations illustrating the use of Latin or Greek particles; it demanded a training which should develop all sides of the man and fit him for the exigencies of active life as contrasted with that of the cloister.

Efforts made in our country sixty years ago to remodel the curriculum so as to satisfy both sides are spoken of as absurd, because they were not radical. They were not absurd; they were the first steps along an untried way. Educational institutions were controlled by medievalists, and the doctrine was ingrained that instruction belonged to the province of the christian minister as much as did the pulpit; the whole system had grown up under the requirements of the church and under the limitations permitted by the church; so that, in considering the change, those in charge found themselves at a loss. Their Latin was no longer a 'modern' language, it was no longer the common tongue of learned men; Greek, at best, had been only a luxury. The study of material things, having led men to doubt respecting some matters of religious belief which had come down without challenge from antiquity, was tainted with suspicion of sacrilege; of its true nature they were wholly ignorant. The best that could be done was done; within college walls, the classical languages gradually ceased to be living languages, came to be regarded as dead languages, their words were used as medium for teaching a kind of universal grammar, and the average student, after spending a round dozen of years in the so-called study of Latin, thought himself uncommonly accomplished if he were able to read his diploma without resort to a lexicon or grammar. The course leading up to the degree, for there was but one degree, was broadened gradually so as to embrace additional subjects. But until fifty years ago it consisted in most colleges of linguistics, that is to say, Latin and Greek with practical neglect of English, a notable amount of pure mathematics, a medley of courses in history and philosophy, with a trifle of natural science. In some institutions, additional branches were inserted, the courses were differentiated and a new degree was granted to those who, neglecting the classical languages, had taken instead modern languages and somewhat extended work in natural science.

The concessions to the claims of natural science were made grudgingly; the study of nature was looked upon by 'educated' men generally as a rather low-lived pursuit, not to be encouraged, as it led men away from man, 'man's noblest study.' But there were those who felt

intuitively that it was not safe to entrust the education of their children to men whose circle of vision was so contracted. A reaction came; and when it came, the pendulum, as was to be expected, swung too far in the opposite direction. Semi-technical schools were established, which soon became either purely technical or purely scientific, in each case thrusting aside almost wholly the literary studies of the older system. These appeared to meet the requirement of the time and quickly grew to great importance, in some cases overshadowing older institutions near at hand. They gave degrees, commonly the scientific baccalaureate, of the college; in many cases they were incorporated with universities and at length stood on the same footing with the schools of law, medicine or theology. They admitted students at the same age as did the colleges, though the entrance requirements in some directions were less rigid. But those requirements were made more and more severe until it became necessary to increase college requirements; and this in turn led to increased requirements as well as to elevation in grade of instruction in law and medicine with, as a final outcome, a lengthening of the course in these two departments—while in some institutions a bachelor's degree became a prerequisite for the professional diploma. The results of these varied changes have been disastrous in several ways to the college and to college training.

The outcome was inevitable in one direction. Two schoolmates, leaving the preparatory school together, go for advanced study to the same institution; one enters the college on the scientific side, to take a course in cultural studies; the other enters the technical school to become an engineer. The boys meet on the same campus almost every day; for a time, they may meet occasionally in the same class-room; they speak in both cases of being at college. At the close of four years, each receives the degree of B.S., one in pure science, the other in engineering. To their friends, the degree is the same in both cases; but it is not, as the friends quickly discover; the engineer has now a profession and is ready to begin his life's work, whereas the other is still confronted with a course of three or four years, if professional work be his aim.

It was natural that a demand for shortening of the college period should be made, that there should be a cry to save the early years of the man's life. It was said that increased requirements for entrance had made it impossible for men to graduate at sixteen or eighteen as they did fifty years ago; that the advance in grade of instruction had made the man who completes the junior year fully equal to the graduate of fifty years ago. But this argument can not hold. The average of college graduates, as appears from study of alumni catalogues, is very little greater to-day than it was thirty or forty years ago, and, in any event, there is no reason why it ought to be greater. That requirements

along some lines have been increased is true, but one must not forget that opportunity for preparation has been increased to a much greater extent. Fifty years ago, schools offering good preparation for college were rare in agricultural districts, and young men in such districts were dependent upon the country clergyman for preparation. Now, however, secondary schools are within reach in almost all parts of our country and a farmer boy can be made ready for college at almost as early age as the city boy. Despite these facts, the cry was heeded, the college period was shortened and, in a number of our universities, professional study during the last year of the college course counts toward both college and professional degree; so that from entrance into college to final graduation with professional degree in law, the period is the same as it was years ago, when the course was one year shorter, or one year less than it was forty years ago in institutions where the course has not been lengthened; forty years ago, the medical degree was reached in six years, now it is obtained in seven, though the professional course has been lengthened by two years. The suggestion has been made that the time spent at college should be shortened still further and that mere training should be thrown back upon the secondary schools. This plan, if adopted, would bring little relief, for, no doubt, the secondary schools, in their anxiety to avoid oppressing their pupils, would find it necessary to insist on still shorter lessons and on ampler time for recreation, so that nothing would be saved in time unless the college period be shortened still further—at last to extinction.

The injury has been more serious in another direction.

In all fairness, one must concede that the 'regular' college course of twenty or twenty-five years ago, despite the preponderance of classical teaching, had gained so far by the introduction of new subjects that it did give a broad aspect of things to the average student. It offered such a thorough taste of many branches of learning as to let him find where his strength lay. Even forty years ago it had developed much along the same lines in the larger colleges as well as in the newer of the small colleges. But specialization grew up rapidly in the scientific schools and this example, reinforced by a popular demand for broader opportunities of selection, led to specialization in college work. Practically the old college course has disappeared in many of the more prominent institutions, and in its stead one finds broad election in some, narrow groups in others. In some, a compulsory broad course is the freshman's lot, but in higher classes the student follows a chosen group, in which some special branch absorbs most of his time, all others being subordinate; in others, election begins with the sophomore year and is nominally almost unfettered, though adroit manipulation of the recitation schedule may impose serious limitations.

University methods of instruction have been introduced and laboratory work is made an important feature, to the exclusion of information courses, which should go toward making the student a well-informed man. Even the high schools have been infected, and in one city, at least, the lad of fourteen has the opportunity to elect a considerable part of his studies.

The whole system of groups or of wide election in the earlier years is based upon an erroneous conception of the proper aim of college work. No considerable proportion of American students are competent to decide at the outset of the college career or even at the close of the freshman year what studies they should pursue; nor in the vast majority of cases are the parents competent to decide the question. One is told that the German student is but nineteen years old when he enters the university, where all courses are open; and then is asked if he is prepared to assert that the American boy is less capable than the German boy. The question of capability or non-capability has nothing to do with the matter. When American secondary schools attain to the grade of the German gymnasium and American boys are compelled to undergo severe preparatory training such as is given in the gymnasium, they will be at least as competent to make a choice as are the German boys. But that matter is neither here nor there in this connection, for the training in our secondary schools is too frequently such as to cause only pain and annoyance to college instructors. The whole system is wrong, in view of the imperfect preliminary drill received by our students. No physical director would permit a hollow-chested, slender-armed sophomore to confine himself to leg exercises, merely because he has chosen book-canvassing as his life's work. Yet such freedom is allowed in the vastly more important matter of mental training; a sophomore who thinks he intends to become a clergyman is permitted to confine his attention to classics and literature; another, who finds mathematics distasteful and acquiring a vocabulary irksome, is permitted to select a course omitting those subjects, because he expects to be a lawyer; while another has the opportunity to select a still narrower course because he has medicine in view. So men pass through college, some to reach the ministry as 'leaders of thought' and at the same time to be laughing stocks for the children of the parish, because ignorant of the works of the God whom they preach; others to become lawyers and to find themslves shut out from the most important branches of practise, because ignorant of the fundamental principles of science; others still to become physicians and to find themselves handicapped in the race by inability to communicate their thoughts in direct language; while most of them enter life's struggle with a stock of ignorance utterly discreditable to a young man of the twentieth century. The error throughout is due to forgetfulness of the fact that the college is a training not a professional school.

That our present method or lack of method is successful, no one asserts. The practical shortening of the college course to three years and the proposition to shorten it still further are in themselves confessions of failure. They are more than that; they are acknowledgment that, in the competition between colleges, the race for degrees has been made so easy that all the mental training given in the four years' course can be given readily in three if not in two. And this acknowledgment appears to be not wholly unreasonable. As matters now stand, there is ample time even in the three years for men to complete the course for A.B. or B.S. creditably, while in addition they take elaborate courses in glee clubs, baseball, football, amateur journalism and other branches of learning, which require not only much time at home, but also frequent absences and excursions during term time. The correctness of the conclusion is made more evident by the fact that men following these collateral pursuits are required to maintain a fair standing in their classes. A fine degree of skill in determining the minimum degree of required work is attained by many of them; and their example is not altogether without influence upon their fellows, for it is well known that among students the 'dig' is a somewhat disreputable character. There is no room for surprise when one discovers that business men often look upon the college course as four years of training in the science of shirk and regret that social requirements compel them to send their boys to college.

The evil can not be corrected by shortening the college period. In truth, this proposition to shorten the period evidences another erroneous conception of the purpose of the college itself—a conception which seems to be gaining wide currency. The college is not an institution whose chief function is that of conferring degrees. This certainly seems to be the conception of many outside of the colleges as well as of not a few within, for there appears to be no end of ingenious methods whereby those who can not attend college may find a way of passing examinations, of receiving degrees and of becoming enrolled among the alumni, meanwhile adding to the glory of their college by swelling its numbers.

A thoughtful consideration of the conditions in American colleges reveals the fact that, during the last forty years, a great change has come about in the relations of instructors and students. In many respects this has been greatly to the advantage of both, but in others very much to their disadvantage. College matters have been adapted largely to accord with wishes of the students; the young men determine almost wholly the details of their courses; they regulate in no small degree the general conduct of matters so that a positive assertion of faculty authority causes surprise and is apt to arouse resentment; athletic associations complain bitterly because stringent rules are

made by the authorities; editors of college publications rebel against rebukes or censures for indecent or scurrilous attacks upon officers of the institution and are ready to denounce them as interference with the liberty of the press. It would appear as if the college faculty, in the opinion of too many students, is an inconvenient and somewhat disagreeable, but unfortunately necessary, appendage to the student body.

Clearly enough, the change has not been altogether for good. The old adage says 'He who would command must first learn to obey.' It is but the expression of human experience. That American lads are sorely in need of such training is only too evident; but they can not get it in secondary schools dependent upon tuition fees for their support. Such training means more—training to think, to reason. Lads too often fail to receive this training in secondary schools, as any instructor who has to deal with freshmen can testify. In any event, the secondary schools of to-day can not give this training in its completeness, for they have not become fully adjusted to the suddenly expanded requirements for admission to college or scientific or technical school, and in their present state of development are little better than cramming houses to fit pupils to answer odds and ends of questions in papers for entrance examinations. Loose thinking and restlessness under constraint characterize the American student in the lower classes at college; lack of home training may be responsible in part for the latter characteristic; inferior teaching in secondary schools is largely responsible for the former.

The corrective for the evils which beset our colleges is not transfer of the training to secondary schools, which can not give it, but a return to the college organization of twenty-five years ago, to the college with a course four years long, mainly compulsory, with little election prior to the senior year—not to the old course in its narrowness but to the old course with its compulsion and with increased severity. Four years are none too long for the necessary moral and intellectual discipline, and the graduate, who afterward enters law or medicine, will still be so young as to make clients and patients hesitate to employ him. If the cry for earlier admission to professional schools must be heeded, lessen the entrance requirements for the college—though even that might fail: the increasing solicitude of parents for the health of their sons and the schoolmasters' canny dread of pushing pupils too rapidly are familiar phenomena. The course should be a broad one, embracing linguistics, philosophy, mathematics and natural science, each term being used in its wide sense, and each group in proper proportion to its importance to-day. Every branch should be so taught as to give mental training and at the same time knowledge, that at graduation the faithful student may have laid the foundation for becoming a 'well

furnished' man. Throughout, it should be remembered that college is not intended only for those who look forward to professional life.

And this means also a change in the preparation of men for college chairs. Men go through college as specialists; they follow graduate courses as specialists; they become college instructors as specialists. Such training does not fit men for college teaching, however well it may fit them for university teaching. Having never had symmetrical mental training, they can not understand the true purpose of college work, and they are liable to make the college student narrower than themselves. There must be a return to the older type of professors, men whose studies were not confined to the immediate area of their chairs. We are accustomed to laugh at the notion that a college consisting of a boy at one end of a log and Mark Hopkins at the other was complete—and we are right; but the conception underlying that notion is true in no small degree. The graduate of such a college had learned to think and the information which he had received was correlated, was his own. The writer reveres the memory of such a teacher in his college, Benjamin N. Martin, who, teaching philosophy well, succeeded also in welding together for the student mathematics, history and science into a well-related body of knowledge. His pupils learned to think and, as far as in them lay, to think for themselves.

Not the classics but the method of training made the men in the older colleges; students learned to think and they were compelled to obey. They learned much of self-control in college—an easier school than that of the world, where college students of to-day must learn the same lesson—or fail.

THE FUNCTIONS OF MUSEUMS: A RE-SURVEY.

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WE are rapidly approaching, and some parts of the world have already reached, that millennium desired by the writer—was it not Professor E. S. Morse?—who exclaimed 'Public libraries in every town! then why not public museums?' With this increase in number has come a change of function, or at least an added function or two. Such a change is in the nature of an adaptation to the new surroundings, and is necessary for the vigorous life and propagation of the modern type of museum. How great the change is may be realized by contrasting, let us say, the American Museum of Natural History, which not only arranges attractive exhibits, but makes them known by its popular *Journal,* with some museums in Europe that still appear to be maintained in the interests of their staff, while the public is only admitted for a few hours each week, to gape at an unorganized crowd of objects which it can not comprehend. The student of science or of art who has to make his living as a curator in a public museum, which is public in fact and not merely in name, often envies those colleagues who, undisturbed by the *profanum vulgus,* spend a peaceful life in original research, such as he can only squeeze in at the close of a hard day's work. But in America and Britain we can never go back to those old days when visitors, after securing tickets by prayer of some high person, assembled at the gate of the British Museum and were conducted around it by a verger with a livery and a black wand as his chief qualifications for the task. Nor indeed can we now find ourselves in the position of that eager spinster, who, after many a vain attempt, journeyed from her suburban residence through mire and fog to those giant portals. 'Which department, Madam?' said the majestic policeman on the threshold. 'Oh! just a general look around, thank you.' 'Museum closed to-day, Mum, except for students.' Back on a 'bus to Brompton, and 'No more British Museum for me!'

No, the times have changed and are still changing. A stage in the advance was marked when Flower and Brown Goode gave us their masterly surveys of museum organization. They laid down the lines on which we have all been working. But still the outer conditions are changing, and in some respects we fail to keep pace. The occasion for

a re-survey of the situation recently presented itself to me, and I was led to the conclusion that a redisposition of our forces was required if we were to cope adequately with the difficulties of the present situation. On that occasion, however, I had another object in view, and alluded to this question only so far as was necessary to explain certain proposals with regard to art-museums.* The subject is too important to be dealt with as a side-issue, and so I wish to discuss some aspects of it a little more fully.

Let us then consider the main purposes of museums, and see first how each of them may best be worked out, and secondly how they may be combined when necessary.

First, then: What are the functions of museums? Multifarious though they are, the more important of them may be placed under three heads:

(*a*) The collection and preservation of material for study by experts, so that they may widen the bounds of knowledge. The ultimate aim of this function may be summed up in one word—investigation.

(*b*) The collection, preservation and exhibition of material for the education of less advanced students and for the assistance of amateurs. The provision for students covers such collections and exhibitions as samples of textiles for the use of weavers, specimens of wood-carving and of wrought iron for the workers in wood and in metal, plaster cases, paintings and engravings for students of the plastic and graphic arts, anatomical preparations for medical students, series of natural objects or of physical apparatus and the like for young people taking their B.Sc. The term 'amateurs' is a convenient one to include the field-naturalists who come to a museum to identify their captures, the collector of coins, of postage stamps or of china, who wishes to verify some recent acquisition, and, in short, the many lovers of art, who without being artists, art critics or connoisseurs, yet enjoy the examination of even inferior productions of some school or period in which they have assumed an interest. For students and amateurs alike, this function of the museum may briefly be expressed as instruction.

(*c*) The selection and display of material in such a way as to attract the general public, to provide for its members intellectual and esthetic pleasure, and so eventually to interest them in noble things outside the daily groove. Any one who visits a museum, or any portion of a museum, not as a specialist or student, but as a sight-seer, is to be regarded as one of the general public. To every such layman, learned or unlearned, the museum should help to give that higher and broader

* Museums Association. Aberdeen Conference, 1903. 'Address by the President,' *Museums Journal*, III., pp. 71–94, 110–132 and 36 plates; September and October, 1903.

outlook on life for which we have no better name than culture. In a word, the third great function of a museum is inspiration.

It must be recognized clearly that these three functions—investigation, instruction and inspiration—are quite distinct from one another. Their point of contact lies in the fact that all are carried out by institutions in which material objects are assembled; and that there is any contact at all depends partly on the convenience of utilizing the same objects for different purposes, and partly on the economy of employing one staff of curators (or one curator) instead of three. But the distinctness of the functions will be realized by taking the standpoint of the several visitors; for they constitute separate and mutually intolerant groups: the specialist disdainful of the amateur and ignoring the public, the amateur and college student with an absurd reverence for those specialists whom they have not yet found out, and the public gaping at the spectacled enthusiast with a mildly contemptuous pity. The same individual may come into each of these classes, but, so far as any one branch of knowledge is concerned, he does so at different periods: first, as a member of the public, he receives the inspiration; then, after learning something in the field or in the classroom, he comes to the museum for further instruction; finally, he advances to the ranks of the researchers and finds in our cabinets material for investigation.

From what has been said it follows that, in considering how a museum may best fulfil these main functions, or, in other words, best serve these three classes of visitors, we shall do well to treat them distinctly.

Beginning with the function of investigation, we see that a museum serves investigators by collecting and preserving fresh material for research, or by accumulating standard historical specimens, such as those which in systematic biology are known as types.

An enquiry into the methods of collection scarcely falls within the scheme of this survey; but I should like to express my conviction that, in general, the best results are obtained when a definite purpose is clearly kept in view. If expeditions are sent out, they should be specially equipped and informed towards the acquisition of particular specimens. If purchases are made, they should be, not of miscellaneous collections, but of preselected objects. The curator should know what his museum wants, and should bend his energies to obtaining those things and those alone. He should resist the temptation of cheap bargains. But when temptation comes as a present, and the donor is a patron who may not be offended—what then? Well, then the curator without a settled plan must open his mouth and shut his eyes, take what the millionaire sends him, and pray for a speedy release. But donors generally mean well, and even a millionaire may have com-

mon sense. Therefore, the curator with a plan, and with a little tact, will say "My dear Mæcænas! This is a charming thing you offer; I only wish we could accept it. But you will understand at once that it does not fall within the scheme drawn up for our museum and sanctioned by the authorities [here he will drag in the most imposing authorities at his command]. On the other hand, there are many sad gaps in our collection, and there is now in the market a most desirable rarity, which I should rejoice to have in our museum with your name attached. When you see it you will agree that it will bear perpetual witness to your discrimination no less than to your generosity." But it is possible that those 'authorities,' on whom the curator ought to rely, may themselves be the difficulty. Then the curator must stiffen his back and, with as much dignity as is politic, say "Gentlemen, you have yourselves appointed me to a position of trust, and it is my duty towards you and the public to advise you on these matters. If you dispute my competence, you stultify your own action."

This need for keeping to a plan in the acquisition of material applies to all museums, whatever be the nature of their contents and whichever function they profess to fulfil. But chiefly does it apply to the smaller museums and to those of limited scope, since it is the best way, I will not say to prevent overcrowding, but at least to put off that evil day. And among such museums it applies most forcibly to those that make their chief appeal to the great public.

But to return to the investigators. What methods of preservation are the most favorable to their studies? Preservation includes both the technical processes by which objects are saved from decay and the disposition or storage of the objects within the museum. It is with the latter division of the subject that I am now concerned. The methods adopted must be such as to permit readiness of access to the specimens, readiness of comparison and readiness of handling. The investigator must be afforded quiet, light, space, and facilities for using such apparatus as may be required for his study, such as books, microscopes, measures, brushes, reagents, and the materials for drawing, painting and writing. Clearly the exhibition of the specimens in galleries visited all day long by the public is opposed to every one of these wants. They are best met by keeping the specimens, when their size and constitution admit, in a series of interchangeable drawers.* Such drawers can readily be removed to a private workroom for study, and may, while there, be stacked in a spare cabinet body kept for the purpose. The specimens may then be examined and replaced without disturbance of their order, and with the least possible trouble to the museum-staff.

But in almost all departments of a museum we are met by objects

* There are many excellent models. Some are described in Appendix II. of the address above referred to.

too large for such treatment, or otherwise incapable of being kept in drawers. The usual solution (if so it can be called) is to place such objects on public exhibition, because in the public galleries alone can room be found for them, or the show-cases are the only receptacles big enough for them. This method of storing such specimens is opposed to all the requirements of the investigator, and has the additional defects of disturbing the harmonious arrangement of the exhibition-gallery, and of distracting the public with a multitude of unsuitable objects. For all parties, then, it were better to shut off a portion of the exhibition space and to devote it to storage alone.

Passing now to the function of instruction, we have to see how a museum may best serve students and amateurs. To its activities of collecting and preserving, it must add a third—that of exhibiting specimens.

The remarks on collecting need no repetition. As regards the other activities, two essentials must be kept in view. First, the need of the student to handle specimens in certain instances. Secondly, access for him to a fairly large series of accurately labeled specimens, the handling of which is not as a rule required.

The objects to be handled, which need not be very numerous, must be kept in such a way that their removal does not interfere with the exhibited series, does not require the prolonged attendance of a member of the staff, and does not give much trouble in unlocking, checking and so forth. For this purpose, therefore, it is as well to have a sample collection, stored in a workroom, or placed on its walls; and in this room might be posted an attendant, who would usually be carrying on his regular work.

The series not as a rule to be handled might be kept either in cases or in stop-drawers, under glass. What is important is that it should not interfere with or encroach on the public exhibits, for the following reasons: The public distracts the student; the student, with his chair and his own specimens, or his note-books, or his easel, gets in the way of the public; the explanatory labels useful to this class of student are too advanced for the general public and act as a deterrent; and here again the mere multitude of specimens, frequently of restricted interest, is but a source of weariness to the lay mind.

On these grounds the rooms for the technical series should be set apart, and should be in connection with a library whence books might be taken into them. The specimens on exhibition might be as numerous as space allowed, so long as needless duplication was avoided. There would be no need for elaborate methods of mounting; it is only essential that each specimen, with its label, should be clearly visible.*

* Only to those familiar with museums will this remark appear a needless truism.

The last function, that of inspiring the layman with an interest in the subject-matter of the museum, demands adherence to two leading principles. First, only a few specimens should be shown, and those the best obtainable. Secondly, the arrangement of the objects must both arrest attention and give pleasure, so that the visit may be repeated. Here, then, we speak not so much of 'collection and exhibition' as of 'selection and display.' In these two respects, as well as in minor details, such as the nature of the labels, the spaciousness of the rooms and the absence of any need for handling, the requirements of the lay public are, if not always opposed to, at least different from, those of either investigators or students.

Thus far then, we are, I trust, agreed not only that museums have three distinct classes of visitors, but that the proper methods of fulfilling those functions are likewise distinct. Possibly these considerations may help the curator to find an answer, when he asks the question: 'What exactly is the object of my museum and how nearly do I attain it?'

The curator, however, may fear that, since museums are so various, and the activities even of a single museum so numerous and diverse, therefore the question can only admit of a confused and futile answer. This complexity may be partly disentangled if he realizes that museums may be classified in various ways. For instance, according to their subject-matter, as of geology, fine-art, archeology, sanitation and the rest. So far as this is concerned the answer to the question is in each case obvious and needs no discussion here.

Another point of view is that of their financial relations to the community. A museum may be under national, provincial or municipal control; it may be run by some semi-public body,—a university, a local society, or a trade guild; it may be a purely private concern —the secluded treasure of a dilettante, the money-making show of a company, or the freely open halls of a philanthropist. This classification indicates the class of visitor for whom the museum is intended: the guild museum for the members of a trade, the university museum for the university student, and the state museum for 'all sorts and conditions of men.' But the connection is not inevitable.

Omitting other possible classifications, we find that the only one bearing on the curator's problem is that according to the visitors either actual or desired. In its main lines this follows our classification of the functions of a museum under three heads. Few museums, however, have their scope so rigorously defined, though in some cases, as just suggested, it is, or should be, defined by circumstances.

Perhaps the most usual restriction is to that group of functions above comprehended under instruction. Here and here alone come the teaching collections of a university, the technological museum for artisans,

and the gallery of plaster casts for art-students. Frequently, too, the museum of a local society is intended solely to preserve natural or artificial objects for reference by the collectors and amateurs who constitute its members.

Scarcely any museum can nowadays be regarded as the strict preserve of investigators. In fact, the total number of museums whose main function it is to amass vast collections for the advancement of knowledge can never be very great; indeed, the smaller the better. The scattering of material and of the necessary literary apparatus through thousands of towns would not conduce to either economy or efficiency. Concentration permits of comparison, better equipment, a larger and more highly trained staff, while it necessitates the intercourse of fellow-workers and leads to interchange of ideas. Such a museum should be a great organization for research, with laboratories, libraries, studios and publications, with a staff of investigators, preparators, artists, photographers, copyists and the usual servants. I have not mentioned curators, believing any attempt to separate them from investigators to be a false economy.

Museums entirely devoted to the inspiration of the lay public are hard to find. But they exist in theory if not in practice; and theorectically too the encouragement of art and science among the populace is the main reason for the establishment of most museums, especially the municipal.

Now, where museums come to grief is in attempting to sit on these three stools, or rather through not distinguishing clearly enough that the stools are three and that they are of very different nature.

A small museum with small means should make the choice of not more than two out of the three; and the function to be dropped should, in my opinion, be investigation. Not that the curators of small museums should be warned off the field of original work; but the museum should neither amass nor preserve specimens of interest chiefly to specialists. From the two remaining functions, instruction and inspiration, it should select the one more appropriate to the conditions of its existence and spend its energies on that.

Many a large museum, on the other hand, is able to undertake all three functions, and if it be supported out of public funds, it is its duty so to do. It is not enough to provide admirably for two classes of visitors, and to suppose that the same provision will satisfy the third class. On the contrary, the more thoroughly the wants of any two classes are supplied, the more will the third class be left out in the cold.

Take the case of a large museum of any subject. Usually an attempt is made to combine all three functions in one series of rooms and cases. For the sake of the collectors and amateurs, a large number of objects is exhibited; and this perplexes the public. For the

sake of students, too, technical terms and labels are introduced; these are above the ordinary visitor and disgust him. For the sake of the public, on the other hand, much space, time and money are devoted to elaborate mounting of the objects. This, in itself to be commended, and practicable when restricted to a selected series, sets a standard that is far too high for application to all the thousands of exhibited specimens, since this extension of it absorbs energy that were better employed in other directions, and renders the specimens less accessible to both investigator and student. Again, much of the material amassed for the specialist is not readily stored, and, finding its way into the show-cases, detracts from their effect and overweights both layman and student.

For such a museum then, I suggest a tripartite arrangement of the collections, corresponding with the three functions.

First, there would be a stored series, in drawers, or special cases, or private rooms, so arranged as to be easily transferred to the work-rooms, and reserved for the use of specialists or researchers.

The series for students may assume two forms. One, a collection of objects to be handled, best stored in a private room and immediately accessible to accredited students. The other, a large exhibited series, under glass when advisable, arranged systematically and properly labeled, but without superfluous niceties of mounting. This should be kept in galleries to which access could be had on application to an attendant. The general public should not be permitted to wander freely through them, and especially should loving couples and infants in arms be warned off. It would probably be a sufficient barrier if each visitor were required to write his or her name and address in a book kept at the entrance.

Finally, there would be other rooms for a smaller series of carefully selected objects, so arranged as to make the utmost appeal to the great public.

The fundamental distinction between the series for research and that for public exhibition has long been realized by directors of natural history museums, and has been strenuously urged by Flower and Brown Goode. The directors of art-museums are just beginning to apprehend it; but even the best museums of natural history are still far from the ideal upheld, not for the first time, in Flower's address to the British Association fourteen years ago. If I may judge from my own limited experience, the chief reason for this failure is the existence of those two distinct types of visitor, the layman and the student. We are obliged in self-defence to exhibit far more specimens than we know to be good for the public, because if we did not we should be doing little else than answering the enquiries of amateurs, and unlocking drawers for all manner of students. Moreover, in the absence of

proper store-cabinets, and especially of interchangeable drawers, our reduced and over-worked staff finds it less trouble to thrust a new acquisition into a show-case than to make room for it in the confused and crowded study-series.

It is to obviate such difficulties that I propose the further division of the exhibited series. In this way more specimens can be exhibited for the student and amateur with less trouble and expense, and in a more practical manner, as, for example, on interchangeable trays or frames, which can as needed be removed for the use of the specialist. The student will no longer be disturbed by the loud-voiced pastor or by urchins at hide-and-seek, and the elimination of crowds will permit a saving in floor and cubic space. The public galleries in their turn will be freed from students with their apparatus and from inappropriate specimens, while such objects as remain can be displayed in a more becoming manner.

It is easy enough to see where we have gone wrong. The advance towards democracy has been too rapid, the revolution too complete. We have thrown open everything to the public, to the public's bewilderment and our own undoing. The lot of a curator in a large museum is not altogether a happy one. Surrounded by the treasures that his heart longs for, he must maintain them for the use and enjoyment of others, while, Tantalus-like, he himself is unable to reach them. He consoles himself with the thought that he is a martyr for the good of humanity, and he has not seen how to shift his ever-increasing burden. The suggestions here made will, I believe, benefit the specialist, the student and the man in the street; but the argument most likely to secure their adoption is that they will also benefit the curator. If consistently and boldly carried out, they would result in a saving of expense on architecture and installation, so leaving more money for actual work on the collections; and they would, in the various ways that I have indicated, effect a saving of time, thus permitting the curator to make better use of the material at his command. In this firm belief, I ask for these proposals the serious consideration of the large number of people who to-day are interested in museums.

THE ERUPTION OF PELÉE, JULY 9, 1902.

By Professor T. A. JAGGAR, Jr.
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A DESCRIPTION of the scene of devastation in Martinique was published by the writer in this magazine in August, 1902. Some of the readers of The Popular Science Monthly may be interested in the details of a great eruption, and scientific deductions from observation of the same; the present article aims to present the results of such observation. The writer returned to Martinique from Barbados in June, 1902, and had the good fortune to see an eruption of first magnitude on Mount Pelée. On the evening of the ninth of July, he was in Fort de France, and the commission sent out by the Royal Society, Drs. Tempest Anderson and John S. Flett, were living on board the sloop *Minerva* near Carbet; thus the scientific record kept of this eruption was unusually complete.

At 8:15 in the evening, just at twilight, there was seen from Fort de France a very high column of black dust with the characteristic cauliflower surface, boiling straight up from the direction of the volcano to an enormous height (compare Fig. 1). The blackness of this dust cloud increased, the bulbous profile gave place to a smooth balloon-shaped outline slightly flattened above, and from the moment that the interior of the cloud first became obscure, small spicular lightnings were seen dancing like a myriad of bright white sparks all over the cloud surface. At first this whole extraordinary display was perfectly silent; the writer was called out from the public library in Fort de France by an attendant at about 8:20 P.M., and there was a singularly oppressive stillness noticeable. When the phenomenon was first observed in the streets, some slight disturbance akin to panic had been audible, but the people as a whole had grown so callous to these happenings, that after a few moments very few individuals seemed to take any note of the extraordinary phenomena in the northwestern sky.

At 8:30 the cloud had the form of a balloon, swelling rapidly to the zenith, and filling with its diameter perhaps 70° of the sky north-northwest. The wonderful coruscations grew more brilliant, leaping rapidly from place to place over the surface of the cloud, but at first they had the form of points of light, rather than lines. There was no thunder accompanying these early flashes, and their frequency was incessant, the whole cloud surface fairly scintillating with dancing lights.

Gradually a sound became perceptible, which at no time developed into loud detonations. It was rather a bubbling growl, far away, different from thunder, and continuous. It lasted an hour, and varied in intensity; this noise was undoubtedly occasioned by the expansion of steam released from the crater's throat, accompanied by the tumble of a volcanic avalanche on the flanks of the mountain and at the crater. The distance of Fort de France from the crater, as the crow flies, is fourteen miles. The weather was very calm, with only a faint breeze from the direction of the volcano during the early stages of the eruption.

The writer climbed to the ridge-pole of the roof of the Hotel Ivanes, while an attendant held a candle at the open dormer window below, and the flame was not disturbed by any considerable breeze. On the high roof, the stillness of the tropical night was relieved by nothing but the simmering hum of tree-toads and crickets, and the very faint distant rumble, at that time barely audible. Here, remote from the odors of the town, there was an extremely faint odor of sulphur (sulphurous acid). At 8:50 a wave was noticed on the wharves at Fort de France, the water receding and returning through a total vertical distance of about two feet. About the same time the recently repaired cable of the telegraph company ceased to make connections; it was probably broken by submarine landslips.

During the next twenty minutes the balloon or spoon-shaped cloud spread rapidly southward until nearly the whole horizon was obscured with the exception of a narrow strip of starlit sky, the middle of which lay S. 20° E. To the north-northeast could be seen fringing showers, four or five in number, showing as vertical streaks against the horizon in that direction. These were believed at the time to represent local dust falls. At 9:10 a similar curtain was seen N. 60° W. At 9:15 some rain fell at Fort de France, but this lasted only about five minutes. At 9:18 the smoothly curved edge of the dust lowered to and merged with the horizon S. 30° E. A very remarkable flash of lightning at this time shot across the northern sky, making a complete loop overturned to the northeast with the ends downward towards the volcano. It was described by one of the bystanders as 'balloon lightning,' and had somewhat the aspect of a huge incandescent bulb, outlined by a streak of light that swept in a tremendous curve across the zenith. The bulbous effect was probably produced by the illumination of one of the cloud billows within the lightning circle. It occurred to the writer that possibly the change in the lightning forms during the two hours, from points to short lines, and from these to long serpents, was due to a change in the perspective of the cloud billows. The first view when the mushroom was expanding was 'end on,' so to speak, with reference to the individual nodes or mamelli.

When the cloud spread over Fort de France these necessarily rolled out into long billows and irregular kidney-shaped forms, the lower surface of which might sometimes be seen when illumined by the lightning flashes. Discharges from node to node, with the 'end on' view, would be small points of light, like the sparks between the electrodes of an induction machine when the two are pushed together. They would also be very numerous and incessant as the individual nodes were numerous, small and possessed of intensest vertical velocities over the direct discharge from the volcano's throat. As the mushroom spread to a distance the individual dust eddies became larger and more diffuse, and the discharge between them would become less frequent and more irregular, giving rise to the worm stage. With further increase and more massive movements within the cloud, the same continually growing in volume and rising to greater height as well as spreading across the line of vision of the observer below, the lightning flashes decreased in frequency, and increased in length, intensity and irregularity, producing finally the long orange-colored serpents described below—the color being due to the dust layer which partially obscured the dazzling flashes.

Whatever the cause, the lightning clearly showed a gradual change in character; from incessant, shifting, scintillating points it changed to less frequent worm-like lines and short forking discharges, the divergence being at first downward toward the crater. One flash was noticed in a direction N. 30° W. having a distinct short S shape with three inflections, the ∞ lying horizontal. At no time were any lightning flashes seen to pass from earth to cloud or *vice versa;* all of these discharges were *across* the sky. At 9:30 the continuous grumbling from the volcano died away.

At 9:42 the middle of the dust arc southward had the bearing S. 20° E. This point corresponded to what at the start was the zenith point of the dust balloon.

At 9:45 very brilliant sheet lightning occurred showing no definite points or lines, but illumining the whole vault in dazzling flashes. The lightning seemed to be more concentrated on the periphery of the cloud. Meanwhile white cumulus clouds lifted towering thunder heads to the southeast and these marked the beginning of local thunder-storms over all the high points of the island. The high tops of these clouds lighted by the sheet lightning showed their billowy profiles white against the dark vault of dust above; some of them appeared to rise to a great height, but their summits were far below the black dome of volcanic dust, affording an excellent measure of the stupendous height of the volcanic cloud and its electrical phenomena —both entirely distinct from the rain-bearing thunder-storms.

At 9:52, looking southwest, the thin edge of the dust cloud against

the starlit sky beyond appeared to have risen somewhat and to be thinner and more transparent where it had before been black and hard-edged. Its rise could be measured by the group of royal palms about the statue of the Empress Josephine, which lay in that direction. These notes were made from the middle of the open 'Savane' or common, while a negro boy held a candle for making compass observations and writing. The increase in sheet lightnings was accompanied by thunder claps from different directions. Some of these came from the east, and they were undoubtedly produced by the local showers.

At 10 o'clock it was pitch dark, with no horizon visible; white clouds rose high southwest.

At 10:08 heavy thunder was heard to the north in the direction of the high Pitons de Carbet. The lightning from the dust vault had grown more sparse and the short worms had gradually given place to elongate serpent-like flashes with increasing intervals. Following these thunder crashes from the north, there was a magnificent lightning display across the zenith. At 10:10, in the direction of the volcano north-northwest, long curved orange flashes rent the vault from east to west.

At 10:15 rumbling was renewed from the direction of the volcano and lightning was also seen. This rumbling resembled rather a slight renewal of the steam explosions than local thunder. It is worthy of note that the sound at Martinique under the dust cloud was different from that observed at great distances. At Barbados this eruption of the night of the ninth was heard distinctly as a series of heavy detonations in quick succession, resembling heavy ordnance close at hand. The distance, over one hundred miles, and the angle by which the sound traveled, probably from above the dust vault, produced a different acoustic effect from what was observed in the immediate vicinity of the volcano. Probably only the louder explosions carried so far, which would account for the discontinuous quality of the detonations. At Fort de France the effect was as though the dust billows had a muffling effect.

At 10:25 there was a cessation of active phenomena for nearly a half hour.

At 10:50 a breeze sprang up from the south.

At 10:55 there was heavy thunder in the northwest, and some serpent flashes of lightning.

At 11:15 the dust dome was obscured by rain clouds, showers fell and there was occasional distant lightning.

At 11:40 thunder was heard to the south. At this time a quadrant of the southern horizon cleared, showing itself below the straight edge of overhanging cloud. After this the night settled down to a condition of quiet cloudiness with the wind southerly, and the temperature

80° F. At midnight two sheets of white paper were placed upon an open balcony and in the morning, after six hours, these showed a film of specks of volcanic dust.

At 2:30 A.M. the moon appeared through the dust cloud with a dim reddish-yellow glow.

The next morning, July 10, at 6:30 the writer took a small steamer north, along the west coast of Martinique to Carbet, where an excellent view was obtained of the slopes of Mt. Pelée, with their newly deposited load of dust and volcanic débris. The morning dawned with high banks of cumulus cloud and a hazy sunrise; there were some light showers. When the volcano came in sight, the usual dark dust veil was seen lowering upon the ocean far to the west (Fig. 2), and the summit was veiled in billowy clouds. From a point near Morne aux Boeuf northward, the vegetation and the beach stones showed a coating of gray dust, which became more conspicuous on approaching the volcano.

The slopes of the mountain, seen at first enveloped in a rain shower, were steaming in two places along the Rivière Blanche, and a long streak of steaming deposits was seen on the high slopes above the Rivière Sêche—the Rivière des Pères was also steaming. The slopes were covered everywhere with patches of light greyish-yellow sand and gravel, hot and dry, which blew up in whirling dust clouds now and then under the puffs of easterly wind. Along the water front, at the mouths of the various rivers, there were occasional steam jets; the dust clung to the cliff surfaces of the high rock walls, outlining the rugged surface in patterns like a fresh snowfall on a cliff face in the Alps. The greatest masses of dry deposit were accumulated in drifts along the course of the Rivière Blanche. This fact is important, showing that along this gulch there accumulates in the course of a series of eruptions a very great thickness of hot dry gravel and sand, which is the cause of the violent explosions along the gorge whenever water rushes down from above.

At Carbet there had been a dust fall on the evening of July 9, averaging perhaps one centimeter in thickness. There had been a preliminary small eruption, earlier in the evening; the great eruption at 8:15 happened quite suddenly. The scintillating lightning flashes were observed at Carbet from the start; dust and small pebbles fell shortly afterwards. At Fonds St. Dénis, on the heights back of St. Pierre, angular rocks fell of sizes up to three or four inches. There was continuous rumbling from the crater noted at Carbet, and this was quite distinct from the local thunder storms which developed later. The eruption was watched from the beach at Carbet Point by Mr. Gouyer, manager of a plantation at Carbet, and he states positively that he saw no tornado or wind blast which struck St.

Pierre. No one was hurt at either Morne Rouge or Carbet. It seems agreed among those living near the volcano, that these later eruptions were more 'fiery' than the earlier ones, indicating that there is more incandescent material ejected; thus they state that there was more 'fire' on June 6 than on May 20; and more slides or avalanches of incandescent material on the slopes of the mountain on July 9 than on June 6.

At about 8 o'clock on the morning of July 11, a vertical puff from the volcano rose 10,000 feet into the air, showing at first superb gray-brown cauliflower surfaces, and later, taking on smooth outlines, with a funnel-shape and a feathery fringe. There was only a single puff, and the cloud drifted away to leeward. A similar one was photographed on July 16 (Fig. 1).

It is of interest to compare with this record of observations at Fort de France, the notes of the British men of science on July 9 made from a vessel close to the volcano:*

From the fissure in the volcano, clouds of pale slaty vapour rose constantly. . . . (About 7:30 P.M.)

In the rapidly-falling twilight we sat on deck intently watching the activity of the volcano, . . . when our attention was suddenly attracted to a cloud which was not exactly like any of the steam 'cauliflowers' we had hitherto seen. It was globular, with a bulging, nodular surface; at first glance not unlike an ordinary steam jet, but darker in color, being dark slate approaching black. . . . Its behaviour . . . was unique. It did not rise in the air, but rested there, poised on the lip of the fissure, for quite a while as it seemed, and retained its shape so long that we could not suppose it to be a mere steam cloud. Evidently it had been emitted with sufficient violence to raise it over the lip of the crater, but it was too heavy to soar up in the air like a mass of vapor, and it lay rolling and spouting on the slopes of the hill. The wind had no power over it, fresh protuberances spurted out from its surface, but it did not drift leeward any more than if it had been a gigantic boulder.

This cloud rolled straight down, gradually increasing in size as it came nearer. The further it traveled the faster it came. It cleared the mountains slope, increasing always in size, but still rounded, globular, with boiling, pillowy surface, pitch black, and through it little streaks of lightning scintillated. On reaching the north side of St. Pierre roadstead the black mass discharged sparkling lightnings incessantly along its contact with the water. The cloud quickly lost velocity and formed a black pall, with larger, less vigorous, more globular, bulging convolutions. It lay almost like a dead mass on the surface of the sea. The black cloud rose from the fissure about 7:40, and for twenty or thirty minutes the sloop sailed southward with a gentle breeze from the east. Then the wind fell to a dead calm. The black cloud cleared, above the fissure a faint red glare was seen, which slowly increased, and bright, glowing masses were seen describing parabolic paths through the

* 'Report on the eruptions of the Soufrière, in St. Vincent, in 1902, and on A Visit to Montagne Pelée, in Martinique,' Part I., by Tempest Anderson and John S. Flett. *Phil. Trans. of the Roy Soc. of Lond.*, Series A, Vol. 200, pp. 353–553, 1903. (See page 492 et seq.)

air and then landing on the mountain slopes and rolling down the hill. These red-hot stones were projected as much as a mile from the crater.

Suddenly a great yellow or reddish glare lit up the whole cloud mass, a

FIG. 1. ERUPTION OF MOUNT PELÉE, 4.10 P.M., JULY 16, 1902. (Photo by T. A. Jaggar, Jr.)

This photograph was taken from the S. S. *Dahome* off Fort de France, looking north. On the right is the slope of the Pitons of Carbet. The steam column was over six times the apparent height of these peaks, and its base was twelve miles away. its crest subtended a vertical angle of 29° measured with a handlevel. Allowing for bulge, its height was not less than from four to six miles. The upper portion of the cloud, bent to the right (east), has passed through the trade-wind belt and is moving with the counter-current. A 'cauliflower' wall of dust could be seen moving down to the west at the base of the column, and rolling out from the mountain over the water.

prolonged angry growl burst from the mountain, not loud, but with a 'snarling character.' A red-hot avalanche rose from the cleft in the hillside and poured

over the mountain slopes right down to the sea. It was dull red and in it were brighter streaks thought to be large stones, as they seemed to give off tails of yellow sparks. They bowled along apparently rebounding when they struck the surface of the ground. The dark-red avalanche had a billowy surface, and its velocity was tremendous. "The mist and steam on the mountain top did not allow us to see very clearly how the fiery avalanche arose, but we had a perfect view of its course over the lower flanks of the hills, and its glowing, undulating surface was clearly seen." The red glow faded in a minute or two, and a round black boiling cloud rushed over the sea in front of it, filled with lightnings. This cloud was globular as seen end on, very perfectly rounded, covered with innumerable minor rounded excrescences which were filled with terrific energy. It was full of short lightnings—'A mere succession of flashing points in the great black wall of cloud.' "Many of the flashes were horizontal, others shot obliquely from one lobe to another, while along the base where the black cloud rested on the steel-gray sea, there was a line of sparkling light, constantly changing, varying in amount, but never disappearing."

FIG. 2 (*a*). PUFF FROM CRATER, MT. PELÉE. FIRST STAGE.
(Photos for T. A. Jaggar, by E. C. Rost.)

A gentle puff of wind came from the southeast. The cloud lost its violence and became a gigantic wall with a velvety appearance in the moonlight, resembling a black curtain draped in folds. In size it was estimated to be two miles broad and about one mile high.* The sur-

* 'Preliminary Report,' by same authors, *Proc. Roy. Soc.*, Vol. 70, August 11, 1902, p. 443.

face shimmered like silk and the colors changed to brown and gray, and even white on the edges of the folds, and these changes spread through the whole face of the cloud. The base became darker, and the paler summits soared obliquely upwards and forwards; this was believed due to sinking dust and separated steam.

The steam cloud, with a velocity of twenty miles an hour, came overhead, gray and tongue-shaped, with a blunt rounded apex, and convolutions still forming. The lightnings, reduced in number and frequency, threaded the dark mass in every direction. "A low rumbling noise was given out as the cloud worked its way across the clear, starry sky." It spread across the vault, producing darkness; when it reached the zenith, pebbles fell about the size of a chestnut, cold, and these

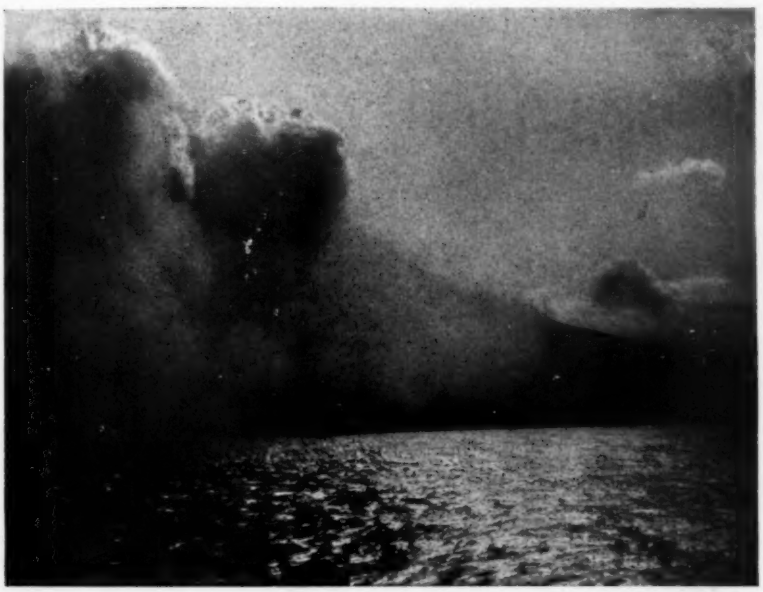

FIG. 2 (*b*). SECOND STAGE. THE DUST VEIL.

became a rattling hail diminishing to the size of peas. Fine gray ash followed in little moist and adherent globules, noiselessly sinking through the air and sticking to everything on which they landed. They were not warm, and there was a slight smell of sulphurous acid. After a few minutes the ash took the form of a gritty dry powder. The layer which fell on deck had a total thickness of one sixteenth of an inch.

The southerly wind rose to a fresh breeze and the naturalists took their sloop into Fort de France harbor safely. They noticed a thunderstorm to the northeast, as heretofore described.

The final comments of Doctors Anderson and Flett may be quoted in full:

The avalanche of hot sand was discharged about 8:20 P.M. In a couple of minutes it had reached the sea and was over. The second black cloud, which was all that remained of it when the heavier dust had subsided, traveled about five miles in six minutes, and very rapidly slowed down, coming to rest and rising from the sea in less than a quarter of an hour. The tongue-shaped steam and dust cloud was over our boat by 8:40. A few minutes after that the ash was falling on our decks.

The second black cloud did not differ in appearance from the first except that it was larger, had a far greater velocity and swept out at least twice as far across the sea. It was black from the first moment when we saw its boiling surface in the moonlight. Both traveled very rapidly over the lower part of the mountain, but slowed down after reaching the sea, and came to rest comparatively suddenly. The lightnings on the two clouds were similar in all respects.

No blast struck us—in fact, we were becalmed—and it seemed that when the black cloud ceased the blast was all over. Nor did the sea rage around us as some have described who were overtaken by the dust storm. When the cloud was passing overhead there was a slight rolling sea, but as the breeze freshened the boat steadied, and there was no unusual disturbance. We watched carefully for a strong indraught, such as was described by more than one observer, but the wind that rose from the southeast was very gentle, and increased gradually to a full-sail breeze. . . .

In the cloud there was a dull, low rumble, but we heard no detonations, and saw no sheet of flame, so that we both agreed that there had been no sudden ignition of quantities of explosive gases. The lights in the cloud, in our opinion, were lightning and nothing else. When the slopes of the mountain were seen two days later it was evident that 'the avalanche had come down approximately along the line of the Rivière Sêche.'

Comparing the records of these observers with the observations made at Fort de France, we find the following simultaneous phenomena:

Anderson & Flett.	*Jaggar.*
7:40 P.M. First black cloud.	7:40 P.M. Not watching.
8:00 P.M. Glare and glowing stones.	8:00 P.M. Not watching.
8:20 P.M. Red-hot avalanche.	8:20 P.M. High balloon-shaped column of dust.
8:35 P.M. Avalanche cloud had come to rest and risen from the sea.	8:35 P.M. Column spreading to zenith, lightnings and rumblings.
8:45 P.M. Avalanche cloud reaches zenith and pebbles fall.	8:50 P.M. Wave observed and cloud spread out to horizon.

The dust-balloon seen from Fort de France was at least five miles high when first observed, its summit subtending an angle not less than 30°. It rose to heights so great that, after spreading out to the horizon, the dust vault was entirely above towering 'thunderhead' cumuli which developed over the mountains of the island. Its first appearance at Fort de France was coincident with the fiery avalanche seen off Carbet;

the British geologists saw no upright shaft of dust, but a cloud projected horizontally two miles broad and one mile high. They state that mist and steam obscured their view of the mountain, and it does not appear that they saw the great vertically projected column of dust at any time. This was because they were too close to the volcano to see it, and the up-jet was obscured by the down-jet.

This leads to certain theoretical considerations. Flett and Anderson consider these eruptions unique with respect to the hot sand avalanche and the black cloud, speaking of the 'Peléan type' of eruption. I do not believe that these features are exceptional, nor that they were wanting in the Vesuvian eruption of '79, nor in Tarawera, Krakatoa or Bandai-san.

Anderson and Flett believe the motive power which drives the lower black cloud forward horizontally to be the falling weight of the mass. Discussing the possibility of the out-blast being caused by the resistance offered by falling materials to the ascent of subsequent discharges—an explanation offered by the writer* in 1902—they write:

> This is quite incompetent to explain the behavior of the black clouds we saw on the night of the ninth of July. Before the first black cloud arose no very great amount of dust had been projected into the air, and the steam clouds were drifting steadily westwards. . . . The black cloud took a different path, and once it had rolled a short way down the mountain there was nothing above it to prevent it rising in the air: but it hugged the surface of the ground so closely that the conclusion was inevitable that it flowed down merely because it was too heavy to ascend.

That no great amount of dust *was seen at Carbet* projected vertically, prior to the first black cloud, may be accounted for in the same way as at the time of the incandescent avalanche—it was dusk, and the mountain's summit was veiled in clouds. I have no question but that there was a preliminary up-puff, not seen by observers close to the crater. And because of the peculiar acoustic conditions mentioned, no sound would be heard, either, though at a distance this puff might have been noticed as a distinct detonation. Without disputing the possibility of dust giving weight to a vortically charged steam-cloud, it is difficult to understand how mere gravitational movement could produce destructive velocities on such gentle slopes—the slopes of Pelée and Soufrière average only 15° to 17° (Fig. 3). The horizontal discharges appeared to move with greater and greater velocity until they struck the sea, then they slowed down and came to rest almost suddenly. The motion was compared to that of a toboggan on a snow-slide.

The appearance of slow movement at the crater's lip I believe to have been only apparent, probably because the mass was end on and

* THE POPULAR SCIENCE MONTHLY, August, 1902, p. 366.

there was no means of judging forward motion. The discharge from a cannon would 'roll, squirt and seethe' without showing any forward motion, if we were looking into the cannon's mouth. There can be no question, however, that there was an avalanche of solid materials which accompanied the second black cloud seen by Anderson and Flett, and I am tempted to ask, may there not have been a similar non-incandescent avalanche with the first cloud, representing the relatively cool material which cleared the crater's throat?

FIG. 3. ST. PIERRE FROM HIGH SLOPE OF PELÉE: SHOWING COURSE OF BLAST AS SEEN FROM THE CRATER.

(Photo for T. A. Jaggar, by E. C. Rost.)

If this were true we should have with each puff a sequence of events somewhat as follows:

1. Straight puff upwards.
2. Avalanche of heavy materials downwards.
3. Horizontal dust-cloud outwards.

The sharply differentiated horizontal and vertical blasts had been noted in all the eruptions of these volcanoes. They may be seen in the photograph of the eruption of July 16, where one cloud lowers over the water, the great column is upright, and its crest is bent to the east by the high counter trade-wind. (Fig. 1.)

The three stages above mentioned, in an explosive discharge from a fissure upward, might have been expected on purely *a priori* grounds.

Following such reasoning further, we find: (1) A rending explosion raises some very coarse and heavy material, (2) this material falls soonest and nearest the crater, (3) such falling material would have very high velocity, but would come very quickly to rest on cone slopes of 17°. Its fall would certainly deflect upward discharges of lesser intensity, and its rush down the mountain with such deflected vomitings would have the aspect of an avalanche, sending forward an avalanche blast capable of short-lived but very fierce destruction. A deflected discharge from the crater would be propelled by the same force as the up-blast, and thus become both an avalanche and a down-blast with the energy of the volcano behind it. It seems probable that such a deflected mass of incandescent gravel and bowlders formed the avalanche seen by Anderson and Flett. On this hypothesis, both gravity and deep-seated explosion contribute to the tornado violence of the black cloud, and the displacement of the air before the avalanche resembles that frequently seen in high mountain districts, where snow-slips project an air blast capable of leveling forests. Such snow-slides have a tendency to hug the slope, to move very rapidly above and to come to rest quickly below, and such movement was noticed in the eruption which destroyed St. Pierre and in the eruption of Bandai-san. In the latter also, the discharge changed from upward to horizontal, the change being gradual as the upper air became overcharged with solid matter. The other eruptions of Pelée and Soufrière showed the same general characters, and that of July 9 may be taken as an example of an eruption of first magnitude. Its direction was more to the westward than on May 8, hence the escape of Carbet and St. Pierre. The materials ejected in the fiery avalanche were believed by Anderson and Flett to be the products of exploded molten lava, which welled over the lip of the crater and was blown to shreds by expansion of gases. This view I can not accept, for I have as yet seen no glass fibers or sherds, nor any evidence of new molten lavas in any way connected with these eruptions. The angular bits of andesite and coarser rocks found on the mountain after eruption are pieces of country-rock. In some cases 'bombs' have been formed from old andesites with half-molten surfaces. All the evidence so far goes to show that these volcanoes are great steam crushers, comminuting and distributing ancient volcanic materials.

In conclusion, I wish to record my admiration of the excellent work done by the Royal Society's commission, recalling with pleasure association with Dr. Anderson and Dr. Flett in Barbados and Martinique. Their memoir is by far the most thorough and scientific work that has been published as yet on the West Indian eruptions.

IMMIGRATION AND THE PUBLIC HEALTH.

By Dr. ALLAN McLAUGHLIN,
U. S. PUBLIC HEALTH AND MARINE HOSPITAL SERVICE.

THE popular belief that immigration constitutes a menace to the public health is not without foundation. Newspapers and magazines contain graphic accounts of the squalor and insanitary conditions of the tenement districts of our great cities. Recent newspaper reports and comments upon the remarkable spread of trachoma in the public schools of New York and other great cities add to the popular feeling of distrust, and the opinion is gaining ground everywhere that more stringent means must be devised for keeping out the undesirable class of immigrants which augments the frightfully overcrowded population of the tenement district of New York and other large cities.

In the consideration of danger to the public health from immigration, three factors must be taken into account: (1) The physique of the immigrant; (2) his destination, and (3) the presence or absence of communicable disease.

The first mentioned, the physique of the immigrant, is by far the most important factor. Good physique was much more general among immigrants a quarter of a century ago than among the immigrants of to-day. The bulk of the immigrants previous to 1880 came from the sturdy races of northern and western Europe, and, not only was good physique the rule, but loathsome, communicable or contagious disease was extremely rare. The immigration from Ireland, Germany and the Scandinavian countries is insignificant to-day compared with the thousands of Slavs, Italians, Hebrews and other immigrants from southern or eastern Europe, which now crowd American-bound vessels and pour through the ports of this country in an ever-increasing stream.

With the change in the racial character of immigration, most marked in the past decade, a pronounced deterioration in the general physique of the immigrants, and a much higher per cent. of loathsome and dangerous disease is noticeable. Thousands of immigrants of poor physique are recorded as such by the medical inspectors at Ellis Island, and a card to this effect sent to the registry clerk or immigrant inspector with the immigrant, but this mere note of physical defect carries little significance under the present law, and the vast majority of them are admitted by the immigration authorities, because it does not appear that the physical defect noted will make the

immigrant a public charge. When the physical defect or poor physique is so marked that it seems to the medical inspector likely to make the immigrant a public charge, the immigrant is detained, and a certificate is made stating his disability, which certificate goes to the board of special inquiry with the detained immigrant. About two thirds of the immigrants so certified as likely to become a public charge are admitted because of the latitude allowed by the phrase, 'likely to become a public charge.' Under the present law, therefore, the immigrant certified as suffering from a loathsome or dangerous contagious disease, or as being idiotic or insane, is deported. The immigrant recorded as having a 'poor physique' or other physical defect is usually admitted.

Destination is scarcely less important than physique, and it is the rule that aliens of a race having a low physical standard will invariably herd together in the overcrowded insanitary tenement districts of our great cities, while the sturdy races of unskilled laborers are scattered over a wide territory and tend to establish little homes of their own in the country or in the suburbs of manufacturing towns or cities.

The following table indicates the relative physical strength of the various races under discussion, and also the percentage of each race giving New York as their destination. Statistics of the Irish and Scandinavian races are given in this table for the purpose of comparison.

Race.	Ratio Sent to Hospital on Arrival to Total Number Landed.	Ratio Deported on Medical Certificate to Total Number Landed.	Percentage Remaining in New York.
Hebrew	1 to 90	1 to 393	70 per cent.
Italian	1 to 177	1 to 535	50
Slav	1 to 200	1 to 575	15
Irish	1 to 645	1 to 1450	33
Scandinavian	1 to 715	1 to 3280	18

The third factor to be considered is the presence of communicable disease among immigrants. The ordinary quarantinable disease are eliminated from the question by efficient quarantine methods, but certain communicable maladies, classed as loathsome or dangerous contagious diseases, exist among immigrants, and constant vigilance and considerable skill are necessary on the part of medical inspectors of immigrants to detect these cases and separate them from the healthy immigrants.

The most important of these diseases, because of its frequency, is trachoma. Of the total number of cases of loathsome or dangerous contagious disease found in immigrants, 87 per cent. are due to trachoma and 10 per cent. to favus.

Several years ago the prevalence of trachoma in the poorer districts of our large cities, and particularly among the foreign-born population, caused numerous requests from medical men engaged in

eye work in various parts of the United States that trachoma be placed in the list of excluded affections. This was done in 1897, with the result that a great many suffering with the disease were taken from among the steerage immigrants and deported. It was then discovered that ordinary steerage aliens suffering from trachoma were being transferred to the cabin, while *en route,* or after being refused passage in the steerage at the port of departure, would be sold a cabin passage, with the assurance that cabin passengers were not inspected at the port of arrival. To check this practise and to make the inspection of aliens complete, an inspection of cabin passengers was instituted in the fall of 1898. The cabin inspection has been very successful in preventing evasion of the law, but many steamship companies were still apparently careless of the diseased condition of immigrants to whom they sold tickets. By the last immigration law (1903) a penalty of $100 is imposed upon the steamship company for each diseased alien brought to our ports, provided the disease evidently existed at the time of the immigrant's taking passage and could have been detected by ordinary medical skill. This penalty has had a salutary effect in causing the steamship companies to institute a more rigid medical inspection at the European ports of departure. Formerly the presence of a diseased alien in the steerage was a matter of more or less indifference to the steamship companies, as they could carry him back to Europe, if deported, and still make a profit on the price of his original passage.

Two points about trachoma have occasioned considerable discussion. These are its contagiousness and its likelihood of causing permanent injury to sight. The contagiousness of trachoma is recognized and conceded by those who have seen a sufficient number of cases of the disease to form an accurate impression. Striking examples of its contagious character can be seen any day on Ellis Island. The Annual Conference of State and Provincial Boards of Health, held at New Haven, October, 1902, placed trachoma in the category of diseases communicable and dangerous to the public health.

Permanent injury to sight is most likely to occur in cases where early treatment is neglected. Among immigrants with trachoma, ignorance of personal hygiene and inability to secure proper treatment make the spread of this disease alarming and the consequences to sight disastrous.

The area in Europe where trachoma is most prevalent extends from the Gulf of Finland on the north to the Black Sea and the Mediterranean on the south, and from Moscow and the Volga on the east to the Carpathian Mountains on the west. In addition, it is prevalent in Greece and southern Italy, probably because of commercial intercourse with Syria, Egypt and the Barbary States. The first-mentioned area is occupied by Finns, Lithuanians, Russians, Poles, Russian-

Germans and Hebrews. The statement is made in some text-books that trachoma is prevalent among the Irish. Observation of immigrants shows that this statement is not true. There is less trachoma among the Irish than any other race of immigrants. The table given below indicates the ratio in which this disease was found among the immigrants landed in 1902.

Race.	Ratio of Cases of Trachoma to Number Immigrants Landed.
Syrian	1 to 66
Armenian	1 to 192
Lithuanian	1 to 375
Finn	1 to 496
Hebrew	1 to 539
Greek	1 to 667
Slav	1 to 758
German	1 to 772
Scotch	1 to 1,216
Magyar	1 to 1,243
Italians	1 to 2,066
Scandinavians	1 to 3,486
English	1 to 3,623
Irish	1 to 4,173

Favus for several years has been included in the list of excluded diseases. If the disease had existed for any length of time, it is, of course, easily detected by the loss of hair and changed character of the individual hairs and the scalp, but in cases of recent origin detection is often difficult because of shrewd efforts at concealment. The immigrants are often prepared for inspection, the tell-tale yellow crusts carefully removed and the scalp cleansed.

Tuberculosis of the lungs is rarely found among immigrants on arrival. Thousands of immigrants are examined whose poor physique suggests to the medical examiner the possible existence of tuberculosis, but out of the many thousands thus examined at Ellis Island last year, only fifteen cases were certified as suffering from tuberculosis of the lungs.

This apparent freedom from tuberculosis is partly explained by the fact that tubercular diseases are notoriously diseases of the cities, while the bulk of our immigration comes from the agricultural communities and small towns. The remarkable prevalence of tuberculosis among recently landed immigrants is the effect of horrible over crowding in infected, filthy tenements by immigrants whose poor physique makes them ready prey for communicable disease. In addition to the horrible congestion of the tenements, the insufficient food and insufficient fuel and clothing, especially among immigrants from Mediterranean countries, must be considered as factors in the development of tuberculosis.

The danger to the public health from immigrants suffering from communicable disease is at present comparatively slight. The United States Public Health and Marine-Hospital Service is charged by law with the medical inspection of all incoming aliens at ports of the

United States. Officers of the service receive special training for their work as medical inspectors of immigrants. Ellis Island, New York, is used by the service as a great school of instruction where young officers, before being detailed for immigration duty at one of the other ports of entry, are trained in the detection of the particular diseases and defects likely to be found in immigrants. Canada has always been a favorite route for undesirable immigrants wishing to evade the law, and officers of the Public Health and Marine-Hospital Service are stationed for immigration duty at Quebec and other Canadian ports, and at various points upon the Canadian frontier. Certain steamship lines make a regular business of carrying to Canada, for subsequent entry to the United States, aliens who have been rejected and sent back from an American port, or who manifestly belong to the excluded classes, or who have been rejected by other steamship lines who have some regard for our laws.

The officers of the Public Health and Marine-Hospital Service stationed at Quebec, Halifax, N. S., and St. Johns, N. B., have authority to examine only those aliens manifested as destined for the United States through Canada. Immigrants so manifested do not differ materially from immigrants ordinarily received at United States ports, and are given certificates of physical fitness which admit them to the United States through any of the border points. Thousands of immigrants evade this inspection at Quebec, Halifax or St. Johns, by being falsely manifested as destined finally to Canada. They have no certificates of inspection by United States officers at Quebec, Halifax or St. Johns, and upon attempting to cross the border are sent back to Montreal for examination.

In order to show the quality of the immigration brought by the Beaver Line and other lines engaged in this nefarious business, it is only necessary to state that 50 per cent. of the immigrants attempting to cross the border in 1902 were rejected, whereas the usual percentage of rejection at United States ports is only one per cent.

A regularly organized system of smuggling diseased immigrants across the border has been exposed by the United States immigration authorities at Montreal, and although the border inspection maintained by the United States Immigration Service is doing splendid work, it is impossible to guard effectively every point of over 3,000 miles of frontier. A more perfect system of exclusion is now possible, and consists of a rigid inspection of all aliens landing at Canadian ports under an effective Canadian law similar in character to our own, which has recently been enacted.

The real danger to the public health from immigration lies in that class of immigrants whose physique is much below American standards, whose employment is in the sweat-shop, and whose residence is the East

Side tenement in New York City. The Mediterranean races, Syrians, Greeks and southern Italians, who are unused to a cold climate, and who often have insufficient clothing, also establish in their crowded 'quarters' splendid foci for the dissemination of disease. The Hebrews, Syrians, Greeks and southern Italians, invariably crowd the most insanitary quarters of the great centers of population. And the various filthy and infected, though perhaps picturesque, foreign 'quarters' constitute to-day the greatest existing menace to the public health.

There are many view points from which our immigrant problem may be judged. There are extremists who advocate the impossible —the complete exclusion of all immigrants, or the complete exclusion of certain races. There are other extremists who pose as humanitarians and philanthropists and who advocate an act of lunacy—removing all restrictions and admitting all the unfortunate—the lame, the halt, the blind and the morally and physically diseased—without let or hindrance. Neither of these extreme positions is tenable. The debarring of all immigrants, or the unjust discrimination against any particular race, is illogical, bigoted and un-American. On the other hand, the indiscriminate admission of a horde of diseased, defective and destitute immigrants would be a crime against the body politic which could not be justified by false pretense of humanity or a mistaken spirit of philanthropy.

The sane, logical position must fall between these two extremes. It is necessary for us to restrict and debar, if possible, all undesirable immigrants. A jealous regard for the public weal may demand measures and standards which seem to the humanitarian and philanthropist selfish and inhuman; but charity begins at home, and it is the right of Americans to exclude the undesirable and to employ whatever measures and set whatever standards may seem necessary to exclude any class which menaces the social or physical welfare of the country.

If we debar any undesirable class of immigrants under the law, we should endeavor to make the law as nearly perfect as possible and debar all undesirable classes. We debar the immigrant with trachoma, syphilis, leprosy or favus; also the insane, the epileptic and the idiotic, but we admit the immigrant with poor physique, unless it is so marked as to make him undeniably a public charge.

There should be but one standard of physique for the immigrant, no matter whether his destination be the Pennsylvania mines or the New York sweat-shops. The skilled laborer should be expected to possess the same rugged physique as is now expected of the unskilled laborer. The standard should be fixed by law by comparison with other well-recognized standards of physique, and should be sufficiently high to exclude all who could not beyond doubt make a living at

hard manual labor. The wording of the law should be definite enough to make the medical certificate of poor physique equivalent to deportation.

This requirement of a definite physical standard in immigrants could be exacted without undue hardship of all unmarried male immigrants within certain age limits, for instance eighteen to forty-five. In regard to families, comprising women, children and old men, in addition to males between the ages of eighteen and forty-five, each family should be required to have at least one member constituting its chief support who could comply with the physical requirements of the law. The law need not apply to parents coming here to join their children, provided the children had established a home here and presented evidence of ability to care properly for their parents.

If the thousands of recruits for the sweat-shop army which arrive each year could be thus checked for ten years, the present existing tenement house problem would solve itself. The terrible congestion of the tenements would be relieved; the scale of wages for the sweat-shop worker would be elevated, and the general sanitary conditions of life in such districts as the Lower East Side, New York City, could be improved sufficiently to reduce the menace to the public health from this cause to a minimum.

THE SUCCESSFUL WOMEN OF AMERICA.

By AMANDA CAROLYN NORTHROP,
NEW YORK.

IT is now half a century since a few women began with the most insistent perseverance to demand a place in the political, professional and economic world. They made this demand on the ground that woman's brain is equal to man's, and, given a fair chance, women could successfully compete with man in every field, except where physical strength and endurance were necessary. Man's opposition to this demand, though at times bitter and determined, has been so far overcome that to-day woman has every opportunity for gaining the best educational and professional training, and has already taken her place in the ranks of every profession except that of the armed defenders of her country. Either with or without the consent of her brother, she has got most of the things she has asked for, and some things which she neither asked for nor wanted. She has accomplished much, but her achievements are still looked upon with misgivings by many, as is seen in the frequent discussions of 'The New Woman,' 'The Unquiet Sex' and the 'Evils of the Higher Education.' In all these discussions there is the constant comparison of the two sexes in ability, perseverance and poise. But since they entered the race with the tremendous advantage of centuries of mental training and experience on the side of the men, it is most unjust to draw comparisons.

Putting therefore all comparisons entirely aside, it seemed worth while to make a study, as far as was possible, of those women who have achieved in public or professional life that measure of success sufficient to give them a place among the successful men and women of America, for the purpose of finding out in what lines of work the greater probabilities of success lie, and what part educational training seems to have had.

The material used as a basis of this study is found in the latest edition of 'Who's Who in America.' It would be difficult to find any two persons who would quite agree as to what constitutes success. And this book admittedly has sins of both omission and commission, still it is probably as nearly complete as a book of this kind could well be. The points considered will be found in the following table. The blank spaces and small figures show the incompleteness of data in many cases. The conclusions therefore are only tentative.

The 1902 edition of 'Who's Who in America' contains the names

of 11,551 living men and women together with brief biographical sketches giving, as far as possible, birth, parentage, education, marriage and profession. Of these names 977 are women, a ratio of 1:11⅔. Sixteen out of this number are well-known actresses and opera singers who are Americans neither by birth nor residence; six are ladies of social prominence, wives of distinguished men; and one is a deposed queen, which leaves 954 to be considered in this paper.

A careful study of these practically self-written biographies has revealed many interesting facts and tendencies. This is especially true so far as they answer two important questions: First, what professions seem to give the greatest opportunity for success; and second, what educational preparation seems most helpful and necessary. In the order of numbers, they stand as follows: Authors, including novelist, essayist, writer, poet, historian, 487; artists, including painter, sculptor, engraver, etcher, illustrator and architect, 103; educators, including lecturers, 91; journalists, including editor, critic and correspondent, 65; actresses, 59; musicians, 43; social reformers, including club-women and settlement workers, 27; physicians, 21; scientists, including naturalists, 17; ministers, including salvation army and missionary workers, 13; philanthropists, 12; librarians, 9; lawyers, 9; miscellaneous, 3. These figures, it will be seen, amount to five more than the whole number of persons classified, because that number of women are represented as actively engaged in more than one vocation.

The accompanying table shows both the number and the per cent. of those married in each profession, the average age, so far as given, and the general education as well as the particular colleges represented.

The tendency of successful women to marriage does not seem great, the per cent. being only 54. In every case, except the minister and lawyer, the table shows less than sixty per cent. married, and it seems probable that a large number of the women in these professions married before they entered professional life. The journalist comes next in the per cent. married, while the artist falls to 42 per cent., and the educator runs very little risk—if she considers it a risk—her chances of matrimony being only 26.3 per cent. or a little over one to four. The cause of this invites speculation. Is it merely disinclination on her part, or is it because she has less opportunity for meeting congenial men; or can it be that her acquisition of knowledge and possibly the *instructive habit* makes her less attractive to men? At any rate, success and matrimony do not seem to go hand in hand with the educator. It will doubtless cause surprise that the table shows only about half the successful actresses married. This may be due to their omitting the fact of their marriage, because they find it to their advantage professionally to be supposed unmarried, and it may possibly be due to the fact that they seem to *unmarry* with so much ease.

		Number Who gave Age.	Per Cent. Who gave Age.	Average Age.	Number Married.	Per Cent. Married.
Authors	487	345	70.4	53.3	287	58.9
Artists	103	63	64.	44.4	44	42.7
Educators	91	69	75.8	49.2	24	27.3
Journalists	65	46	70.7	50.8	44	67.6
Actresses	59	33	55.9	44.4	31	52.5
Musicians	43	31	72.	40.7	25	58.2
Social reformers	27	22	80.	60.3	16	55.1
Physicians	21	16	76.2	60.7	9	42.8
Scientists	17	11	58.8	50.2	10	58.8
Clergy	13	12	92.3	52.6	12	92.3
Philanthropists	12	9	75.	60	7	58.3
Librarians	9	7	77.7	47	3	33.3
Lawyers	9	6	66.6	58.5	8	88.8
Financier	1	1	100	67	1	100
Life saver	1	1	100	61	1	100
Seed grower	1	1	100	57		
Total.		659	69	52.6	522	54+

	Educated in Public Schools.	Per Cent.	Private School.	Per Cent.	College.	Per Cent.
Authors	55	11.3	201	41.3	62	12.7
Artists	5	4.8	19	18.4	4	2.9
Educators	25	27.4	30	32.9	42	46.
Journalists	8	12.3	26	40.	12	18.5
Actresses	1	1.7	10	16.9	1	1.7
Musicians	5	11.6	10	23.3	1	2.3
Social reformers	3	11.1	16	59.3	4	14.4
Physicians	2	9.5	7	33.3	7	33.3
Scientists	5	29.4	4	23.5	7	41.
Clergy	2	15.4	2	15.4	5	38.5
Philanthropists	1		5		0	
Librarians			3		2	22.2
Lawyers	2		3		1	11.1
Financier			1			
Life saver						
Seed grower			1			
Total.	111	11.7	325	34	148	15.5

	Vassar.	Wellesley.	Smith.	Radcliffe.	Bryn Mawr.	Other Colleges.
Authors	7	8	6	2	1	38
Artists	1					3
Educators	7	3	2	2	2	26
Journalists	1					11
Actresses						1
Musicians						1
Social reformers				1		3
Physicians	2					5
Scientists	1			1	1	4
Clergy						
Philanthropists		2		1		1
Librarians						2
Lawyers						
Financier, life saver and seed grower						
Total.	19	13	8	7	4	95

As to age, the table shows that only 69 per cent. gave their age, so that the conclusions drawn are not perhaps of great value. Still if a woman's inclination to tell her age does not increase with age, it would seem fair to draw the conclusion that the path to what the

	Number born before 1850.	College Graduates.	Per Cent.	Number born between '50 and '60.	College Graduates
Authors	179	36	20	83	40
Artists	22	1	4.5	14	1
Educators	21	9	42.8	27	19
Journalists	20	3	15	10	3
Actresses	10	0		4	0
Musicians	3	0		10	0
Social reformers	15	0		4	1
Physicians	11	3	27.2	3	3
Scientists	5	1	20	3	1
Clergy	6	2	33.3	3	2
Philanthropists	6	0		1	0
Librarians	1	0		4	1
Lawyers	3	1	33.3	3	0
Financier	1	0			
Life saver	1	0			
Seed grower	1	0			
Total.	305	55	18	169	31

	Per Cent.	Number born between '60 and '70.	College Graduates.	Per Cent.
Authors	48	60	35	58.3
Artists	7.1	14	2	14.1
Educators	70.3	17	10	58.8
Journalists	30	8	1	12.5
Actresses		11	0	
Musicians		12	0	
Social reformers	25	3	2	66.6
Physicians	100	2	1	50
Scientists	33.3	3	0	
Clergy.	66.6	3	1	33.3
Philanthropists		2	1	50
Librarians	25			
Lawyers				
Financier				
Life saver				
Seed grower				
Total.	18.3	75	20	26.6

	Number born between '70 and '80.	College Graduates.	Per Cent.	Number born between. '80 and '90
Authors	21	10	47.6	2
Artists	13	0		
Educators	4	4	100	
Journalists	8	1	12.5	
Actresses	8	1	12.5	
Musicians	6	0		
Social reformers	0	0		
Physicians	0			
Scientists				
Clergy.				
Philanthropists				
Librarians				
Lawyers				
Financier				
Life saver				
Seed grower				
Total.	39	16	15.4	2

world calls success is long and full of obstacles for the woman who attempts it. The musician seems to reach the goal first, her age aver-

aging 40.7 years, and the actress and the artist stand next. They each average 44.4 years.

In the matter of education, the technical education is not considered, the object of the writer being to find the importance which general education and college training hold in the making of a successful woman. It is true, however, that most of the artists and the musicians and many of the educators studied abroad in their special lines. Where no mention whatever is made of education, the writer concludes that it must have been slight.

The table indicates that college training has played a small part in woman's success, only 148 or 15.5 per cent. The largest percentage of college bred women is found among scientists, ministers and educators, but even the number of educators who have had college training is less than half, while in all the other professions, except the ones already named, the table shows less than one fourth to be college women. Some of these women have taken more than one degree, and others have studied in one or more colleges and universities without having taken a degree in any. The question, however, is not so much what place college training has occupied in the past, as it is what the tendency toward extended study and investigation seems to be. By arranging those who gave their age in separate columns according to the date of birth, one may get a fair idea of the tendency towards a higher education, and the relative value it bears in the successful life. All those born before 1850 are classed together and the others by decades. The two columns following the date of birth show respectively the number and the per cent. of college women. Among authors there is an increase of college women who were born during the fifties, over those born before 1850. The next decade shows a further increase of ten per cent., but of those born between sixty and seventy there is a *decrease* of ten per cent., or from 58.3 per cent. to 47.6 per cent. Educators, as has already been said, have the largest number of college women. The last decade considered shows only four names, but they are all college bred. If, however, all the professions are considered together, the reader will see that the per cent. of college bred women born between 1860 and 1870 is less than in any preceding period.

The table also shows the chief woman's colleges represented in comparison with coeducational colleges. Vassar, Wellesley, Smith, Radcliffe and Bryn Mawr each count authors and educators of note among their daughters, but beyond these professions they are scarcely represented at all. The other colleges represented are with few exceptions, the coeducational colleges and state universities east of the Mississippi River. With the exception of the philanthropists, the number who were educated in coeducational institutions is in every case

larger than that of all the woman's colleges combined. That is, the majority of these college women were educated in institutions where their instructors were almost exclusively men. If then colleges and especially woman's colleges play so small a part in the success of the women who have been invited to enter the doors of 'Who's Who,' the question naturally rises, where have they received their education?

The prevailing idea seems to be that the private school is all very well for the girl who wants some knowledge of the so-called 'accomplishments' and a sufficient amount of general knowledge to make her fairly intelligent, that they are of value only to those parents who wish the school associates of their daughters to be as nearly as possible among their own social class, but as for giving a pupil anything like thoroughness in the subjects studied, that the private school standards are far below those of the public school. A glance at the table, however, seems to tell quite another story.

The scientists educated in the public school stand to those educated in the private school in the ratio of 5:4, but in every other profession the number educated in private schools far exceeds that of the public schools. Even among educators where thorough knowledge is certainly essential to success, the ratio of those educated in the private school is to those educated in the public school as 6:5; the journalists over 3:1; the physicians 7:2 and the authors over 4:1.

While the public school should not for a moment be undervalued, these figures would seem to give one a reason to believe the private schools of the country to be a valuable educational factor in fitting a woman for a successful career.

It is greatly to be regretted that the biographies investigated are in many cases so incomplete. The results of the investigation are therefore only partly conclusive, or perhaps suggestive. But so far as they go they speak with a degree of authority and nothing is true beyond that point.

SOUTHERN AGRICULTURE: ITS CONDITION AND NEEDS.

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THE south is one of the two great agricultural sections of the United States; the other is the great prairie region of the northwest, a little smaller than the south in area and a little larger in population. By the south is meant what is really the southeastern quarter of the country, skirted on the north by Pennsylvania, the Ohio River, Missouri and Kansas, and sweeping in a broad belt, with a length of about twice its breadth, from Delaware to Texas. The northern borderlands of this region differ so in population and products from the other states of the group that we shall count them only in making general statements, but never in citing illustrative examples.

The Relative Importance of the South.

The relative importance of the south in American agriculture is greater than seems to be recognized by the rest of the country, while it is doubtless less than her own people commonly assume. By comparing the two great agricultural sections of the United States, we discover that the farm property of the south comprises 43 per cent. of the total farm acreage of the country, but only 21 per cent. of all farm values; while she furnishes only $28\frac{7}{10}$ per cent. of the total products. The value of farm products in the south, therefore, is low as compared with the acreage, and the value of farms is still lower. In the northwest, on the other hand, exactly the reverse is the case; that section comprises only 38 per cent. of the total farm acreage of the country, but 56 per cent. of all farm values and 50 per cent. of all farm products. This disadvantageous comparison of the value and products of southern farms is very largely accounted for by the fact that a much greater proportion of lands in that section is still uncultivated than is the case in the northwest. Yet when this has received its due allowance, the southern farmer and the southern statesmen have many lessons to learn from the northwest as to progressive agriculture, both from the standpoint of the individual and from that of the commonwealth.

Georgia and Iowa may serve as typical examples of the greater productivity of the northwest. The two states are about equal in area and population; yet Iowa feeds her live stock annually all but as much

as the total value of farm products in the state of Georgia; while the total value of all Iowa's farm products lacks only one third of one per cent. of equaling the combined totals of Virginia, North Carolina, South Carolina, Georgia and Florida. Only Texas can compare in the volume of her agricultural output with this banner state of the northwest, and even she falls short more than $135,580,000.

We must concede, therefore, that the south occupies the second place among the great geographical divisions of the country as a producer of agricultural wealth.

The Southern Farmer in 1893 and in 1903.

The condition of the southern farmer has immensely improved in the last ten years. To-day he stands, for the first time since the war of secession, in a position promising permanent betterment of his farming and of his social position. Until recent years three causes, any one of which was a fearful incubus, combined to pull him down, viz., low prices, the lien system and bad farming, including under this head poor management and antiquated methods.

Scarcely any impediment is heavier to bear up against than producing for a long term of years for a continuously falling market. Sir Guildford Molesworth estimates that between the years 1872 and 1894 the prices of general commodities fell 50 per cent.; the price of wheat 60 per cent.; that of cotton 70 per cent. In manufactures this depression of prices was in large measure offset by new inventions and economies in production; but the agriculturist, from the nature of his occupation, is almost entirely cut off from such retreats.

To add to the hardship of his salable commodity's constantly falling in price at a rate so rapid that we may say that the value of his cotton appreciably diminished even while the boll expanded, the southern farmer was drawn by circumstances into doing business under a system which subjected him to a ruinous usury and left him almost completely robbed of his freedom as to planting profitable or unprofitable crops. Along with the rest of the structure of southern industry, the war of secession shattered the system of agricultural credit. There was no longer a class of large planters possessed of valuable estates to whom banks of immense capital or wealthy factors stood ready to lend at fair interest. Ready money existed only in the traditions of the past; the southern farmer found himself without the means to buy even the seed to put into the ground. Then the crop lien law came to his assistance and remained to his destruction.

This system of industrial peonage known as the lien law works as follows: The farmer prepares in February for planting. He goes to the proprietor of an establishment, which in its typical form is a

crude department store dealing in every article from medicines to wagons that he is likely to need in his simple existence. He requests the merchant to 'run' him during the year, that is to say, to sell him supplies on credit until the crop is harvested. He promises the merchant to plant a certain acreage of cotton and signs a mortgage upon this yet unplanted crop. He is now at liberty to buy on credit from this particular merchant anything he requires; but he can not buy anywhere else, for he has no cash, and his credit and security are all pledged to his patron merchant. The merchant has two scales of prices, cash and credit, the latter much higher than the former, the excess constituting interest which the lien farmer must pay. With a few merchants the credit prices are scaled down each month, so that the rate of interest remains approximately the same on all goods purchased on lien; but ordinarily the prices remain unchanged up to the last day before settlement, so that the rate of interest rapidly increases as the time before settlement diminishes. On goods which the farmer gets late in the summer, he frequently pays interest above the cash price at the rate of 200 per cent. per annum. For the whole term of credit, extending from February to October, he pays on the average, in different localities, from 40 to 80 per cent. per annum. The usury law forbids the bank to lend him money at a higher rate than 8 per cent., but 'protects' him by allowing the merchant to charge him 200 per cent., on the principle, apparently, that a man may consent to pay any price he chooses for capital in the form of merchandise, but that he is not at liberty to offer more than a moderate price for capital in the form of money, no matter how badly he may need it or how great the benefit to be derived from its possession.

Some large merchants employ a sort of traveling inspector of securities, on whose report of the condition of each customer's crop the question of further advances is determined. Possibly by July the farmer has so much charged against him that the merchant considers it unsafe, in view of the uncertainty of seasons, to allow the crop to cover any further credits, and accordingly declares himself under the painful necessity of declining further sales except on additional security. The farmer then gives a mortgage on his slight furniture, bedding, cows, everything. The law does not allow him to give a mortgage on his wife and children.

Late in the summer the crop is sold. Not to lay the price upon the counter of the lien merchant is, in law, a misdemeanor; but in farming it is starvation for the next year—or at least, the farmer thinks so. Very commonly in good years, and as a general rule in bad ones, the price of the crop does not equal the amount on the merchant's books against the farmer. Sometimes the sheriff is called in to supply the deficit from the real and chattel additional security; but not

generally. The lien, at least in some states, contains a clause requiring the farmer to enter into a similar agreement the next year with the deficit charged against him if he does not succeed in paying out the first year's account.

The iniquity of such a system is exceeded only by the suffering of the farmer under it. To observe its operation makes plain the ground for the Biblical injunction given three thousand years ago to an agricultural people against usury. And the pathos of the lien farmer is that he is always only twelve months from freedom. Better that he should eat but one coarse meal a day and wear his cheap clothes to the last frazzle of decency, and by one unremitted struggle break his chains.

This lien system goes far to account for the amazing fact a few years ago of the southern farmer's persistently planting a full acreage of cotton in the face of an already glutted market. Those who then berated him for his folly little understood his predicament. For the southern cotton farmer, cotton is the only money crop; but for it there is absolutely certain sale, for there exists from the field to the factory a market unexcelled for its thorough and sensitive organization in the commerce of the world. Government bonds can sooner fail of a purchaser than can a bale of cotton. When a lien merchant sells goods with cotton as security, he sells practically for gold paid in hand and by the same act invests his gold at an enormously profitable dividend. If cotton has fallen in price, the merchant requires the farmer to increase his acreage, as more bales are necessary to equal a given sum; and as the farmer's necessities do not diminish with the price of his product, he submits; and so we behold the paradox of men's planting more and more of a certain crop for the sole reason that to plant it is becoming less and less desirable.

The effect produced upon the character of a people by rack rent is well known; where the tenant promises a rent equaling or exceeding the surplus product of the land above what is necessary to keep him alive, he has no inducement to good farming, as the total surplus produced will be taken from him whether it be great or small. His fields present the most miserable appearance. The same is true of the farmer whose lien just suffices to secure on credit the bare necessities of food,.clothing and farming material. Not infrequently he even neglects to harvest his crop, and the merchant has to send his own men to pick it from the field.

The hard times from 1891 to 1896 were of incalculable benefit to many southern farmers. The terrible experience of usury, depressed prices and industrial peonage led many to resolve to be free from the lien system; and the enforced economy of those years taught how alone that resolution might be realized, viz., by the accumulation of

a certain reserve capital beyond the necessities of each day's living. To save one dollar is better than to earn ten. An indispensable prerequisite to the progress of any people is their learning, by self-denial, to save from this year's consumption something of this year's product. Those farmers who learned this lesson have emerged to a greater or less degree from the shackles of the usurious lien system, and in many instances what formerly went in 80 per cent. interest to the advancing merchant is now drawing 4 per cent. in the savings bank.

Some explanation is necessary of the southern people's continuing a system so bad. It is favored by a large class who could, by proper exertions, live without it, but whose indolence deters them from the supreme effort which would assure their ultimate prosperity; and by a still larger class, generally tenants, whose unfitness to manage farms would require them to become hired laborers if they could not get supplies in advance under the lien law. Thus the system is an evil in three ways: it puts land under the management of earth butchers who destroy the natural resources of the country and reduce its production of wealth; it leads men capable of better into a system of indolence, destroys their credit and self-respect, and robs them of interest in their lifework; and lastly, it proves a terrible master to the man who has once fallen into its subtle, tightening embrace, and who desires independence and progress.

Systems of Farm Tenure.

The development of farm tenures in the south has been from simple to complex. Before the war the system of ownership was dominant; but within that there were two classes—owners who attended to their estates and owners who committed them to salaried managers. Managers, once so common, now operate less than one in a hundred farms in the south—a smaller proportion than in any other section of the union. A southern farmer who is sufficiently trustworthy to have extensive lands committed to his care will give his employer no rest until he consents to sell; or failing in that direction, he buys some old plantation whose proprietor family has either become extinct or moved away in their itching for town life.

The impoverishment of the large planters and the disorganization of the labor force by the war of secession necessitated large plantations being broken up into units sufficiently small to be operated on a limited capital and with a minimum of laborers. Between 1868 and 1873 in Georgia, 32,824 small farms were thus created, and the same process was in operation throughout the south. Thus the immediate tendency of the war was to the distribution of the land in small tracts into more hands; and in this was cause for gratulation; for not only did it open immense new possibilities of social progress and industrial in-

dependence to thousands of white men whose lives had been one of woeful sacrifice to the slave-worked plantation economy, the tragedy of whose wretched existence has never yet been written, but it was calculated vastly to increase the wealth of the country; for, to a point not yet reached in the United States, the productiveness of farms rises exactly as their acreage decreases.

But no sooner had the more enterprising of the southern population begun to succeed than the tendency to a wider distribution of land met a counter tendency towards the increase in the size of estates, doubly augmented by the prosperity of some and the misfortunes of others. It may be safely asserted that to-day the best type of southern farmer either owns a large estate, or is paying for tracts recently added to his plantation, or is expecting to make such additions. He has set a thousand acres as the goal of his ambition. In many localities this feeling has grown into such an insatiable land hunger on the part of wealthy planters as seriously to handicap young farmers who have not inherited property.

One bulwark protects, but not completely, the country from serious injury from this tendency: there are so many men with this same ambition and with the same chances for gratifying it.

The vast majority of southern farmers, 93½ per cent., are included in the three classes of owners, cash tenants and share tenants. Owners operate 47 per cent. of the whole number of farms; cash tenants 17½ per cent., and share tenants 29½ per cent. The desirability of these three classes is in the order of their enumeration, as is also their wealth-producing capacity, even to a degree beyond what appears from glancing at the figures. It is the universal rule that small farms of any given tenure are more productive than large farms; so that when we consider that notwithstanding the fact that cash tenant farms are one third larger than share farms and owner-operated farms are two and one third times larger than share farms, yet the productivity of owners and of cash tenants exceeds that of share tenants, while that of owners almost equals that of the much smaller cash-tenanted farms, the relative superiority of the different forms of tenure is more thoroughly revealed.

TABLE I.

TENURE, AREA AND PRODUCTIVITY OF SOUTHERN FARMS.

	Owners.	Cash Tenants.	Share Tenants.
Number of white farmers.	1,060,559	187,088	491,655
" " colored "	158,078	271,702	280,699
Total number of farmers.	1,218,637	458,790	772,354
Average acreage.	146.9	85.6	62.6
Percentage of all farms.	46.9	17.5	29.5
Percentage of total farm area.	49.5	10.6	13.7
Product per improved acre.	$10.44	$11.48	$10.29

Average size of farms operated by white farmers of all tenures, 173 A.
" " " " " " colored " " " " 53 A.

Share tenants, if they furnish implements, stock and feed, generally give the landlord from one fourth to one third of what they produce; if these are furnished by the landlord, he gets one half the gross product. These proportions sometimes vary in different sections and with different crops. It is simply what in Europe is known as metayer farming.

The status of the renting farmer and his landlord throughout the United States has occasioned some anxiety for the future of the American yeomanry. In the country at large the percentage of owners is appreciably larger than in the south, and both classes of tenants respectively are appreciably smaller; for of the total 5,737,372 American farmers, 54.9 per cent. own the farms they operate, as against 46.9 per cent. in the south. It must be acceded in addition that the tenant system in the south is much more indicative of evil consequences than in other sections. In the northwest, for example, the number of 'tenants' is swelled largely by the sons of aged retired farmers in whom the titles still rest, and by enterprising men who have made the second step in the gradation of hired laborer, tenant, owner. This is true to a much less extent in the south. The tenant class there is composed mainly of shiftless whites who have definitely settled into what has come to be known as the 'tenant class' and of earth-butchering negroes. All the alertness of a landlord close at hand, who is himself strong-willed and a good farmer, is required to save land from deterioration after several years under such tenancy. The safest method has been found to be for the landlord to retain the right to supervise authoritatively every detail of the farming, not only by specific stipulations in the contract, but continually during its execution. Absentee landlordism in the south means, almost inevitably, land butchery.

The Tenant's Outlook.

What is the tenant's chance to attain the ideal of farm life—ownership of the land upon which he works?

The southern farm tenant has the best opportunity of any renter in the world to become an independent proprietor. If, under the improved agricultural conditions which promise to continue, he does not enroll himself among the owners, it will rest as a heavy indictment against his worth of character.

Last year I was driving through one of the richest agricultural sections of the south. A place better fenced and kept than the ordinary impressed me. 'That man was a tenant five years ago,' said my companion. 'He made a small cash payment on that $5,000 cotton and tobacco plantation; he lived hard for four or five years, and now he has paid the last cent of the price.'

A few miles farther on stood a rusty hut of doll house dimensions,

jammed up jealously against the railroad track. In the yard a woman of comely but unclean person washed clothes. The slouchy individual in blue shirt and no suspenders was her husband. Most likely neither of them could distinguish the English language in its printed form from the inscription on an Aztec monument. These tenants might have bought a good farm for less than the clerk in the city would pay for his cottage home; for the average value of farms in the south is only $11.79 an acre, as against $36.25 for lands in the northwest frequently not so productive.

Farm Labor.

The dwellings and wages of southern farm laborers have both improved, the former in the greater degree. No progressive southern planter would to-day build such quarters as were erected twenty years ago. Experience indicates that good quarters attract a better type of laborer and hold him more steadily, and so prove a good investment. In some parts of Louisiana dwellings furnished to a family free of charge (as is throughout the south the universal rule) cost $400. Comfort is subserved in better floors, glass windows and secure ceiling; and decency, in a larger number of rooms.

The condition of the agricultural laborer seems to have improved most in the distinctly staple states, such as Louisiana, Alabama and South Carolina, rather than in those whose agricultural interests are scattering, such as Maryland and Kentucky.

Wages to the laborer are less in the south than in any other section; but there is ground for believing that the cost of labor is greater to the southern farmer than to the northern, western or northwestern; that is to say, a hundred dollars expended for labor in the south brings less return than in any other region of the country. The low efficiency of farm labor is one of the heaviest impediments to the progress of southern agriculture.

One of the results of this inferior help is that the southern farmer enjoys but a small part of the benefits of agricultural inventions; first, because to hire the low priced labor is as cheap in the short run as to buy the machinery, and thus the pace is set at antiquated methods and non-participation in agricultural progress in the long run; and secondly, because such ignorant labor can neither utilize nor take care of expensive machinery.

To understand the inferior quality of southern farm labor necessitates a brief examination of the personnel of the labor force. First, there are the white laborers, comprising something more or less than half the entire number of the actual tillers of the soil. It has been estimated by respectable authorities that the major portion of the cotton is raised by white labor; but concerning a statement of such

importance, I will only say, in the absence of positive proof, that it is not improbable. Certainly, far more of the hands that actually hold the plow are white than is popularly supposed. These laborers generally work for themselves or their parents; and as they do not ostensibly enter the labor market, their numerical importance goes unnoticed.

Secondly, there is the negro farm hand, who contributes the great bulk of the hired labor and is a sort of pace-maker to the white laborer.

Negro Labor in Southern Agriculture.

I shall speak later of the better qualities of the negro; but at this point I must call attention to the widespread prevalence of certain evils which constitute a serious problem in southern agriculture. The generation of the race not yet sobered by middle age, who have never known, on the one hand, the fine discipline of the ante-bellum masters, nor have yet, on the other hand, learned self-discipline in the more trying conditions of freedom, have degenerated to a level lower than any occupied by their race since its African barbarity, and lower, let us hope, than it will ever occupy again. Not only the morals, but —what bears more directly on the present inquiry—the efficiency and reliability of the mass of the negro laborers below the age of forty are injured to a considerable degree by the group of vices represented by the pocket pistol, liquor, a deck of cards and a mistress. A certain dash of wildness marks youth under all colors; but such general statements are by no means adequate to cover the case of the post-bellum southern negro.

Not only are the higher qualities of the laborer depending on character thus destroyed, but this moral degradation has necessarily incurred physical degeneration by initiating the negro into a catalogue of diseases to which his race was forty years ago a stranger. Some investigators assert that something like 70 per cent. of the race are infected with a dangerous type of disease incident to vice.* And yet he works; for his constitution offers a strange resistance to a form of poison that completely invalids the white man, but frequently injures the negro no further than seriously to impair with lassitude and weakness that splendid body his inheritance by nature.

Not only is the negro, like all ignorant labor, inefficient, expensive and unprogressive, but he is suited to only a few staple crops, to the culture of which he has been reared. The negro is an inveterate 'cottontot' and conspires with the lien system to keep southern agriculture to that staple. His preference for cotton is shown by the fact that 71.9 per cent. of the negro farmers of the south are cotton farmers, as against 28.5 per cent. of the white farmers.

* Undeniably the condition is appalling; I would, however, accept such large per cents. with caution.

TABLE II.

PREFERENCE OF THE NEGRO FOR COTTON.

	All Farmers in South	Cotton Farmers.	Percentage of Cotton Farmers to Total.
White farmers in south.	1,869,721	531,333	28.4
Negro " " "	734,362	527,969	71.9

As a rule, not without some exceptions, those counties in the south which have a large negro population are inferior in productiveness to those of similar natural quality in which the negro population is small. The productiveness of the farms of white farmers, north and south, is, with rare exceptions, greater per cultivated acre than the productiveness of lands cultivated by negro farmers.* The fairest basis of comparison is the productiveness of share farmers of the two races; for in this class practically all the management and all the labor are done by the farmer and his own family. Not only do the financial limitations and the small fields of share farmers preclude them from hiring labor, but whites will not work for negro farmers, nor will the negro, if he can avoid it, work for the small white farmer,

TABLE III.

PRODUCTIVITY OF FARMS PER IMPROVED ACRE BY TENURE AND BY RACE OF FARMER.

		WHITE.	NEGRO.			WHITE.	NEGRO.
Ala.	Owners	$11.03	$9.70	Mo.	Owners	$9.58	$9.39
	Share tenants	10.62	9.27		Share tenants	8.24	8.99
Ark.	Owners	11.06	13.07	Neb.	All tenures †	8.83	6.72
	Share tenants	9.88	11.06	N. J.	Owners	22.11	17.85
Cal.	All tenures †	10.87	7.03		Share tenants	18.29	14.57
Fla.	Owners	13.40	8.77	N. Y.	All tenures †	15.70	14.23
	Share tenants	9.62	8.25	N. C.	All tenures †	10.82	10.28
Ga.	Owners	10.91	9.01	Ohio.	Owners	13.36	11.45
	Share tenants	10.53	9.52		Share tenants	12.76	11.63
Ill.	All tenures †	12.49	10.00	Penn.	Owners	15.74	15.43
Ind.	All tenures †	12.26	11.67		Share tenants	14.27	11.57
Iowa.	All tenures †	12.22	12.93	S. C.	Owners	11.90	11.69
Kan.	All tenures †	8.39	7.46		Share tenants	13.26	11.77
Ky.	Owners	8.94	10.29	Tenn.	Owners	10.32	10.70
	Share tenants	10.34	11.89		Share tenants	9.64	10.32
La.‡	Owners	16.71	13.98	Tex.	Owners	12.51	10.04
	Share tenants	11.77	13.28		Share tenants	10.78	9.99
Md.	Owners	12.76	8.37	Va.	Owners	8.55	8.78
	Share tenants	10.43	6.61		Share tenants	7.89	7.97
Miss.‡	Owners	13.13	13.88				
	Share tenants	12.71	14.77				

* The figures of the twelfth census are arranged in such a way as to conceal the shortcomings of the negro farmer, though there was doubtless no intention of producing such a result.

† The census tables giving production of farms of various tenures divide population into 'white' and 'colored.' In some states the number of Chinese farmers is so great as to make anything more than a mere approximation of production by negro farmers of various tenures possible; therefore I did not attempt it, but took the productivity of negro farmers of all tenures as given in a separate table.

‡ A large portion of the rich river bottoms are share-farmed to negroes.

and least of all for another man's 'cropper.' And, sad to say, thousands of white croppers are fully equal to the most benighted negroes in lack of education.

Tables III. and IV. exhibit the relative productiveness of the labor of the two races, and also very strikingly the superiority of the agriculture of owners to that of tenants.

I have selected from the four representative southern states of Alabama, Georgia, Louisiana and South Carolina, the eighty counties (except the two extremes of sea islands and mountains) having the largest and the smallest proportion of negro population. I then found the production per improved acre of the farms in each of these counties. Table IV. contains all those counties whose negro population is 75 per cent. of the whole and all whose production reached $11 per acre. A table of this kind is unduly favorable to the negro, for two reasons: First, those counties throughout the south containing the richest lands were flooded with black population during the slavery régime, and their agricultural population is to-day of the same composition; and secondly, the good farming counties having to-day from 20 to 40 per cent. of negro population generally contained almost no negroes before the war, whereas their towns grown up since have drawn a large number of negroes from a distance, while the country districts are still inhabited in about the same proportion as formerly by whites. Thus a county having 30 per cent. negro population and a large per capita production might appear to one unacquainted with actual conditions to be blessed with just about sufficient negro popula-

TABLE IV.

PERCENTAGE OF NEGRO POPULATION AND PRODUCTION PER IMPROVED ACRE IN CERTAIN SOUTHERN COUNTIES.

	Percent. of Negro Popula.	Prod. per imp. A.		Percent. of Negro Popula.	Prod. per imp. A.
Alabama:			Louisiana:		
Baldwin.	31.5	$15.42	Acadia.	20.5	$13.77
Bibb.	33.5	13.00	Bossier.	78.2	11.96
Lowndes.	86.6	9.85	Calcassieu.	19.6	11.28
Macon.	81.2	8.47	Cameron.	14.6	15.43
Marengo.	76	9.13	Concordia.	87.3	19.27
Russell.	78.1	8.05	East Baton Rouge.	66	12.54
Sumter.	82	8.85	East Carroll.	91.5	16.36
Georgia:			Lafourche.	28.3	32.33
Berrien.	30.5	13.01	Tangipahoa.	30.5	17.94
Burke.	78	8.93	South Carolina:		
Carroll.	18.5	11.01	Anderson.	42	11.04
Charlton.	20.7	13.24	Cherokee.	34.6	14.91
Colquitt.	26.4	11.03	Chester.	77.7	8.52
Dekalb.	33.3	11.29	Fairfield.	76	8.76
Dougherty.	82.8	15.22	Horry.	27	12.80
Douglas.	24.6	11.13			
Hancock.	74.5	6.94			
Houston.	75	7.34			
Stewart.	74.5	8.09			
Tatnall.	35.3	11.10			

tion to do the heavy farm work; but closer examination will generally reveal the fact that an unduly large proportion of these negroes reside in the towns, while the white man still works the one-hundred-acre farm of his fathers. For instance, 32.3 per cent. of the population of the county of Spartanburg, S. C., is put down as negro; but the county seat alone, with a population of 11,395, contains 20 per cent. of the negroes of the entire county, and only 16 per cent. of the whites, and one may ride for hours through many of the townships and see scarcely a black face. And all this is true despite the fact, let it be noted, that during the last twenty years tens of thousands of whites and not one black have been drawn into the towns to man the twenty-eight cotton mills of the county, having an aggregate capital of ten millions of dollars. What negroes there are have largely come from the two counties on the south, which as early as 1850 had a majority of negro population.

It will be observed that only four counties of large negro population are also largely productive, of which one lies in the Flint river bottom in Georgia, being one of about two dozen spots of exceptional richness strewn midway across the state from the Savannah to the Chattahoochee; and three are in the Tensas bottom bordering the Mississippi in Louisiana; and the productiveness of these, it will be noticed, is exceeded by that of counties of large white population similarly situated, as, *e. g.*, Lafourche and Tangipahoa, La.

In conclusion, we may say that a careful study of the tables reveals the facts, first, that the white tenant working for himself usually makes more than the negro tenant working for himself; and second, that in localities in which the large majority of the labor hired by white farmers is black, the production by white owners is generally less than that of white tenants doing their own work and tends to approximate the production by black farmers. That is to say, white ownership farming barely suffices to raise black labor to the level of the efficiency of white tenants.

I am concerned with the negro only in his bearing upon the present condition of southern agriculture, and do not intend the dark pictures I have drawn of his shortcomings as 'views' upon the race question. The best element of our colored people merit sincere praise for their progress; but it can not be denied that the great mass of the negro population, in its present condition, is a fearful incubus upon the industry of the south. To contend that the negro fills such a large part of our economy is not to prove his efficiency or his necessity; for ours is the only great country of the world that is not without his aid. The immediate need of the industry of the south regarding him, whatever his final destiny, is to strengthen his character and raise his intelligence to a point adequate to the proper performance of his economic functions.

TABLE V.

SEVEN LEADING CROPS OF THE SOUTH, WITH THE POPULATION OF EACH TO THE VALUE OF ALL CROPS IN THE UNITED STATES AND TO THE TOTAL VALUE OF THAT CROP IN THE UNITED STATES, AND TO THE TOTAL CROP VALUES OF THE SOUTH.

	Value of All Crops.	Cotton Value.	Percentage of Cotton to All Crop Values.	Percentage of Cotton of South to Cotton of United States.	Corn Value.	Percentage of Corn to All Crop Values.	Percentage of Corn of South to Corn of United States.	Fruit and Vegetable Value.	Percentage of Fruits and Vegetables to All Crop Values.	Percentage of Fruits and Vegetables of South to Fruits and Vegetables of the United States.
U. S.	$2,888,839,638	$370,758,171	13.5		$828,258,326	29		$373,027,418	13.4	
N. Cent.	1,373,021,966	906,782			535,443,048			117,668,356		
South.	948,193,759	369,790,659	39	99.7	250,869,293	26.5	31.5	98,885,012	10.4	26.5

	Hay and Forage Value.	Percentage of Hay and Forage to All Crop Values.	Percentage of Hay and Forage of South to Hay and Forage of United States.	Wheat Value.	Percentage of Wheat to All Crop Values.	Percentage of Wheat of South to Wheat of United States.	Sugar and Sorghum Cane Value.	Percentage of Cane to All Crop Values.	Percentage of Cane of South to Cane of United States.	Rice Value.	Percentage of Rice of All Crop Values.	Percentage of Rice of South to Rice of United States.
U. S.	$484,254,703	16.4		$369,945,320	12.8		$26,644,738	$\frac{8}{10}$		$6,329,562	$\frac{8}{10}$	
N. Cent.	221,866,406			244,332,729			1,916,270*					
South.	59,589,664	$6\frac{3}{10}$	12.3	58,790,460	$6\frac{2}{10}$	15.9	24,693,183	$2\frac{6}{10}$	92.6	6,329,562	$\frac{7}{10}$	100

The aggregate of the above calculations, embracing 91.5 per cent. of all farm products in the south, contains an inaccuracy of only $\frac{14}{100}$ of one per cent., distributed among the seven crops.

* Only sorghum.

What the South Raises.

Such is the machinery of southern agriculture; what does that machinery do? In the first place, it produces crops to the annual value of more than a billion and a third dollars, constituting 28.7 per cent. of the agricultural output of the country. Two staples, cotton and corn, embrace 65½ per cent. of all the crop values of the south, and only seven of her crops can be called in any sense leading, viz., in the order of their value, cotton, corn, fruits and vegetables, hay and forage, wheat, sugar-yielding canes and rice. These comprise 91½ per cent. of all her crop values. Corn has come to occupy a greater acreage than any other crop, having 25,612,949 acres as against 23,518,433 for cotton, which leads us to hope that King Cotton's disastrous tyranny has been tempered to the milder sway of a limited monarch.

Agricultural Education.

The three cardinal needs of the southern farmer to-day are education, diversification and credit.

The fundamental failing of the education offered the southern farmer is that it is not adapted to the end in view. The curricula, past and present, of our schools hardly bear the evidence of being framed for a people whose prosperity depends so largely upon mastering the art and science of the tilling of the soil. The country schools should teach branches bearing upon agriculture, beginning with 'nature study' with the little tots, and extending to physics, chemistry and botany for the mature pupils. Not only should the boy learn of the lovely lea, over which the lowing herd so slowly winds, but he should have an even more intimate acquaintance with the composition of the soil and of the physiology of those cattle. The present system of educating country children fits them for the spheres they are to fill little further than by such unfolding of the intellect as necessarily results from any schooling, but rather presents the anomaly of rearing a great people to unfitness for its life work. The curriculum of rural schools should be such that farmers would feel that they could not afford to allow their children to miss its benefits.

Many southern agricultural colleges meet the need little better and fail signally to send men back to the farm. In this respect a number of schools in the northwest excel ours. The agricultural college of Michigan has sent a larger per cent. of its graduates into farming than professional schools and universities send of their graduates into the professions for which they were prepared. The only plan of agricultural education which has succeeded in any state in its object is to have the institution devoted exclusively to preparing the farmer for his peculiar life work, and at very low expense. 'Agricultural' colleges which give extensive courses in non-agricultural branches are

used simply by young men desiring the shortest cut, and hence an inferior preparation, to a professional career, and the real agricultural interests of the state in question remain almost completely untouched. The 'agricultural' college in which the student can pursue a course largely non-agricultural is a monstrosity, but, unhapppily, not a curiosity.

Louisiana among southern states seems to have succeeded best in agricultural education, though she lacks much of a complete system. She has a number of schools distributed among sections of the state differing in soil, climate, topography and latitude, in which nothing but agricultural sciences and practical farm work are taught, and in which the sons of millionaire sugar planters, along with all others, are compelled to work, not to help pay their expenses, but in order to learn farming.

Diversification.

To urge the uneducated farmer to diversify crops is to make demands beyond his preparation. Tell him that it will render life more interesting, and you are talking into his deaf ear; inform him that it will preserve the fertility of the land, and he will not believe you; point out that though the fruit and vegetable crop is only 2 per cent. of the acreage, it is 8.3 per cent. of the value of all crops of the country; and he will forget it; remind him of the fact that his well-to-do neighbor plants cereals extensively, raises hogs and has a fine flock of sheep, and he will explain that his neighbor can do these things because he is rich, and will stubbornly decline the theory that his neighbor is rich, in part at least, because he does these things. Agricultural education brings agricultural diversification as inevitably as general education produces diversity of professions, and nothing else ever can secure it.

Agricultural Credit.

And lastly the southern farmer needs better facilities for obtaining credit.

Figures for the whole south are not at hand, but those for the state of South Carolina indicate that banking capital is less abundant now than before the war of secession, notwithstanding the rapid multiplication of banks all over the south during the last ten years. The capital, surplus and circulation of banks in South Carolina to-day is $11,802,584, of $8.81 per capita; whereas in 1861 these items for the twenty banks then in existence aggregated $21,031,522, equaling $29.88 per capita; while in 1850 the per capita rate for the same items was $32.73. The disreputable character of much ante-bellum banking necessitates my stating that there was not a single bank failure in South Carolina from the Revolution to 1861; her bankers won the commendation of the most exacting critics, and their notes passed

everywhere for gold. Louisiana is another state with a very similar record.*

These rich banks of the slavery régime lent principally to the large planters, on personal endorsement, stock and bond security, and real estate mortgage. Substantial 'factors' also did an extensive lending business, in a way which made them a sort of predecessors of the modern lien merchant. The factor advanced cash to the planter, secured sometimes by a real estate mortgage, and sometimes only by note, with the promise (not legally enforceable, however) that the crop should stand good for the debt if necessary, and that in any event the factor should enjoy the advantage of handling it. The bank then rediscounted, perhaps at a lower rate, the planter's note as endorsed by the factor. The step to the vampire lien system was made after the war, when the factor was replaced by men who similarly borrowed from the banks upon their mercantile expectations, but who made the handling of the farmer's cotton a subsidiary business, even if they engaged in it at all, and sold him goods at enormous credit prices on such lien security that many a lien merchant has never in any true sense lost a dollar by bad debts, but has simply failed to collect to the extent of more than reasonable profits, instead of the higher ones he set as a standard.

The financial need of the south to-day is more banking capital in close touch with the farmer. Large city banks do not seek agricultural business; they dislike the farmer's business ways, the duration of loans to him, and the character of his security. It is true, however, that the farmer receives fairer treatment at any one of the several $100,000 banks in a large town than at the single very small bank in the very small town.

And rural banking facilities are wonderfully increasing. In several southern states ten years ago there were hardly a dozen banks. One thousand, three hundred and seventy-four of the 2,172 banks existing in the nine States of Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas and Virginia in November, 1902, were established between that date and January 1, 1893—a period of ten years lacking two months.

Some blundering and some unsafe banking have resulted from this sudden multiplication of untrained hands at the business; for the vast majority of these banks are chartered under state law. Yet the agricultural interests have been greatly benefited: and the evils can be remedied by the employment of expert inspectors. The fact that bank

* Banks to-day furnish a large amount of money to the business and agricultural interests by means such as rediscounts, large deposit accounts, etc., item far less important in ante-bellum banking. The relative amount of actual accommodation supplied now and formerly would be an interesting question for bankers acquainted with both past and present conditions in the south.

failures are rare even in states which maintain absolutely no inspection is conclusive evidence of the long strides forward which the public conscience and the public demands have made in banking.

Personal letters to me from bankers in representative counties in Alabama, Georgia, Louisiana, Mississippi and South Carolina corroborate testimony from other sources that the escape of the farmers from the lien system is being hastened and their independence assured just in proportion as they themselves manifest principles of integrity and promptness in their financial affairs; and secondly, as the local bankers or other lenders of cash at legal rates stand ready to make advances to farmers.

The three following typical letters illustrate the progress of the southern farmer towards independence. The first is from northwestern Mississippi and presents an agricultural population whose own shortcomings debar them from assistance:

Our farmers are in much better condition as regards the lien system. The majority either borrow money by trust deed or personal security, usually the former. Our banks extend accommodation to farmers where they can give anything like reasonable or satisfactory security. However, this class of our business has not proven very profitable or satisfactory, for the reason that, in majority of cases, farmers do not realize the necessity of being prompt in meeting their obligations; consequently entail considerable trouble and worry in collecting same, thus in large degree offsetting the profit in interest, as well as the pleasure of business. . . . They need assistance and organization, and all the encouragement possible from such institutions as ours.

The second, from a central Georgia county, not nearly so favored by nature as many others, shows the results of energy, integrity and business methods:

The farmers are borrowing more money from banks than in former years, probably to the extent of 40 or 50 per cent. . . . to avoid paying the large credit prices amounting to more than the bank interest. We make these loans principally upon rent notes, (or) stock and crop mortgages with warehouse and personal endorsement. Our farmers we think in better condition than at any time in twenty years.

The third is from a rich county in southwest Georgia whose farmers have learned business methods approximately as well as its merchants, and are approaching the situation in which they will borrow only to retrieve disaster or to enlarge their operations:

The farmers in the territory supplied by this bank appear to be in better condition each year for the last two or three, and mortgages and liens are getting to be the exception, whereas they were formerly the rule. Almost all the loans to farmers are made on personal security only, and the volume of these loans is decreasing. We can not speak for other sections, but our observation of south Georgia is that the escape from the lien system is general.

Such is the condition of the southern farmer, with whose well-being is wrapped up so much of our best interests. He needs better trained and more moral labor, access to credit at reasonable rates when he requires it, and a system of education suited to his life work.

VOICE, SONG AND SPEECH.

By WM. SCHEPPEGRELL, A.M., M.D.,
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THERE is no physical faculty which so distinguishes man from the lower animals, and marks him more conspicuously in the image of his Maker than the power of articulate speech. That there is some means of communication among the lower animals, we can not doubt, but that faculty of articulate speech which enables us to communicate to our fellowmen not only our ordinary desires and wishes, but even the most delicate shades of our inmost thought, that faculty belongs distinctively to the human race.

This subject may be treated from various standpoints, but we will here limit ourselves to a strictly physical consideration, explaining first the general anatomy of the parts essential in the production of the voice, and afterwards the manner in which these are used in the formation of song and speech.

Before discussing the subject of the voice, we must have some conception of sound in order to understand more fully how the voice is produced and how it is modified by the various parts concerned in the faculty of speech. All sounds are due to the vibration of the surrounding air, which conveys to the ear the vibrations produced by the sound-producing object. Perhaps one of the simplest methods of producing sound is by means of the tuning fork. When this is struck the prongs are made to vibrate, and these in turn set up in the air vibrations which are carried to the drum of the ear, and thence transmitted to the brain as sound.

In sound we have three important qualities, pitch, loudness and timbre. The pitch depends upon the *number of vibrations* which the sounding body makes in a given time. When these vibrations are repeated less than eighteen times per second they produce no musical tone to the ear. When a boy strikes a stick against a paling fence we have simply a rattle. If, however, this could be done so rapidly as to make more than eighteen beats to the second, then the ear would cease to recognize each individual stroke and would perceive a musical tone. The more rapid the vibrations the higher the tone, until the limit of human hearing is reached, which is about 48,000 vibrations to the second.

The second quality of sound, which we may call 'loudness,' is due to the *range of the vibrations* made by the sound-producing body. If

the tuning fork is struck lightly, it gives a certain tone, but very softly. If it be struck hard, however, it produces a louder sound, due to the fact that the vibrations are greater in length, which, being communicated to the ear, set up stronger vibrations in the drum, and we hear a louder sound. This, however, does not vary the *pitch* of the sound which remains identical as long as the number of vibrations per second remain the same.

The third quality of sound is due to the *form of the vibrations* regardless of the pitch or the loudness. The trained ear recognizes, for instance, in the note of the tuning fork, the violin, the clarionet and the piano, the same tone howsoever made. There may be the same degree of loudness, but there is a distinction—this distinction being due to the peculiar form of the wave set up in the air and thus communicated to our ear. This is known as the *timbre* of the sound.

The manner in which the ear distinguishes the loudness and the pitch is easily understood, as the vibrations of the drum of the ear correspond in degree and number to the vibrations of the air and of the sound-producing body. How it distinguishes the timbre of the sound is much more complex. This subject has been carefully investigated, and it is now accepted that with the original or fundamental tone there are always a certain number of over-tones which give this special quality to the sound.

Having now explained some of the fundamental principles of sound, we will discuss the question of how the human vocal apparatus produces that form of sound known as the voice. Undoubtedly the human voice is based upon the same principles as other musical sounds, being, however, more complete, more varied in its capacity and more adjustable to surrounding conditions, than any instrument made by human hands.

The relationship of speech to song is not well understood, many persons believing that in song some special parts of the vocal organs are utilized which are not employed in ordinary speech. As a matter of fact, however, speech is simply a modified form of singing, the principal difference being in the fact that in singing the vowel sounds are prolonged, and the intervals are short, whereas in speech, the words are uttered in what may be called 'staccato' tones, the vowels not being specially prolonged and the intervals between the words being more distinct. The fact that in singing we have a larger range of tones does not properly distinguish it from ordinary speech. In speech we have likewise a variation of tones, and even in ordinary conversation, there is a difference of from three to six semitones, as I have found in my investigations, and in some persons this range is as high as one octave. In this consideration of the voice, therefore, song and speech may be considered under one head.

In the voice, as in other forms of sound, we must have, first, a vibrating body to initiate the sound. This we have in the vocal cords of the human body. The vibrations set up in the vocal cords (Fig. 1) are not due to a violent impact, as in the case of the tuning fork, as this would injure the delicate tissues of the sound-producing organs, but are caused by the air passing between the vocal cords very much as the current of air sets up vibration in a reed instrument such as the clarionet. In the human voice this current of air is furnished by the lungs, which have therefore the double duty of supplying the oxygen to the blood and setting up vibrations in the vocal cords for the voice.

FIG. 1. VOCAL CORDS IN POSITION FOR SPEAKING OR SINGING.

The chest is supplied with the most perfect mechanism for obtaining this current of air. The main support is furnished by the ribs, which give firmness to the chest. These are held together and supported by muscles of great strength which raise the ribs in the act of inspiration. The lower part of the chest is enclosed by a broad flat muscle known as the 'diaphragm,' which materially assists in giving its bellows-like faculty to the chest. In the act of inspiration, the diaphragm is lowered and the ribs are raised, thus creating a space in the lungs which is filled by the air entering through the nose and throat. In expiration, however, this is reversed, the ribs being lowered and the diaphragm raised, the process being assisted by the natural elasticity of the lung tissue. The thorough understanding of this function of the lungs should impress us with the importance of not hampering their action by tight clothing or lacing, which necessarily interferes with their freedom of action, and, by thus lowering the resistance of the body, make it more liable to the entrance of disease.

The two vocal cords, whose vibration forms the essential factor in the voice, are situated within the larynx, the most prominent point of which is known as the 'Adam's apple.' The larynx has several plates of cartilage which, while protecting the delicate organs within, make it less liable to fracture or injury than if they were made of bone. By removing one of the plates of the larynx, we see the edge of one of the vocal cords, which consists of a narrow band of rather hard tissue, whitish in color in health, and surmounted on a band of muscles which not only gives it support but also enables it to adjust the tension necessary for tone-formation. The vocal cords, during

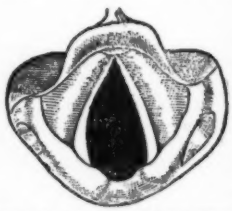


FIG. 2. VOCAL CORDS DURING INSPIRATION.

the act of inspiration (Fig. 2), are wide open so as to allow the free ingress of air, and even during ordinary expiration (Fig. 3) they remain sufficiently wide open not to hamper the freedom of respiration. When the voice is used, however, the lungs having obtained the necessary supply of air, the edges of the vocal cords are brought together (Fig. 1), and, as the air is forced through them by the contraction of the lungs, they are set up in vibration, thus producing the voice.

Two vertical sections of the larynx are shown in Figs. 4 and 5 (after Merkel), the former showing the vocal cords (1, 2) in the lower register, and the latter the vocal cords (1, 2) in the high register. In both Figs., 5 and 6 represent the pockets or ventricles of the larynx, and 3 and 4, the ventricular bands, sometimes called the false vocal cords. Figs. 7 and 8 show a section of a cartilage of the larynx.

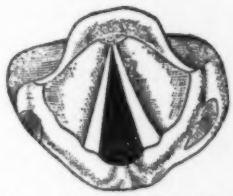
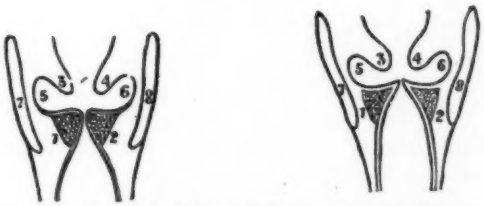


FIG. 3. VOCAL CORDS DURING EXPIRATION.

The voice, like other sounds, varies in pitch, loudness and timbre. The pitch is due to the tension of the vocal cords, the process, however, being somewhat more complicated than in a violin in which there are several strings. There being but one pair of vocal cords in the larynx, the tones are produced, first, by tightening the vocal cords, and, when the limit has been reached, so that a greater degree of tension would be injurious to the vocal cords and the muscles which control them, there is set up a different form of vibration known as the change of register. This subject of the register is somewhat compli-



FIGS. 4 AND 5. VERTICAL SECTIONS OF LARYNX.

cated, but it will be better understood if we suppose that the difference between a low and a high register is due to the fact that in the latter a shorter portion of the vocal cords is set into vibration.

The bass, for instance, produces his lower tones by increasing the tension of the vocal cords until *B flat* (International Pitch) is reached when he changes his register, obtaining his remaining upper tones by contracting the vocal cords in this register. The untrained singer, however, not understanding this change of register, may attempt to reach the upper tones by simply increasing the tension in the lower

register, this soon resulting in hoarseness, inflammation and perhaps permanent injury of the voice.

The ordinary method of speaking of these registers as the 'chest,' 'throat' and 'head' registers is apt to be misleading, as in every case the tones are formed in the larynx and by the vocal cords, the 'head' and other names being derived from the fact that the sound seems to be more directed to these parts of the body.

The loudness of the tone is due to the force with which the air is expelled from the lungs, thus causing a greater range of vibration in the vocal cords. The question of timbre is much more complex. It is this feature which distinguishes the singing of the amateur in music from the professional, the uncultivated from the cultivated voice, and the resonant tones of the orator from the poor voice of the ordinary speaker. As already explained, the quality of tone is entirely influenced by the number of over-tones, these being due to other parts of the throat accessory to the vocal cords in voice production.

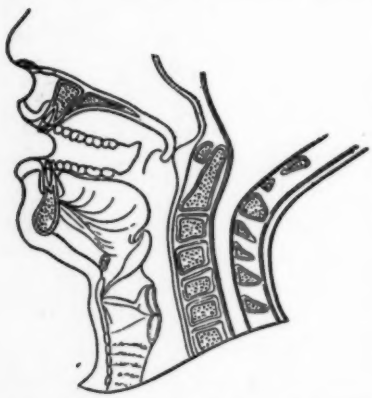


FIG. 6. DIAGRAM OF VOCAL APPARATUS DURING PRONUNCIATION OF VOWEL 'AH' (SEILER).

Before explaining this point, we must first consider what other organs are essential in the production of the voice. The fundamental tones are made in the larynx as already explained, but these alone do not produce articulate speech; in fact, such tones are not limited to the human race. It is the peculiar faculty of articulating that distinguishes the voice of man from that of other animals. Articulation is due to other parts concerned in the organ of speech, such as the tongue, the teeth, the lips, the palate and the nostrils. Each of these has its influence in the formation of the voice, and a defect in any of these will be easily recognized by the experienced hearer.

The fundamental element of the voice is formed by the vowel sounds, the consonants, as the name indicates, simply modifying the vowel sounds. Although nominally the pure vowels are *a, e, i, o* and *u,* the vowel sounds are of far greater number. For instance, the *a* occurs in 'maw,' 'hat' and 'mate,' but in each it is sounded differently and the same occurs with the other vowels.

The simplest vowel is *a* (as in 'ah') which is sounded by vibrating the vocal cords, the sound issuing almost without obstruction, the tongue being lowered and the lips apart. If now, without any further change than to round the lips, the same effort be made, the *a* will be

changed to *o*, and if the lips are still further contracted the *o* will be changed to *u*. The remaining vowels *a* (as in 'hate'), *e* and *i* are made from the fundamental *a* above described, by contracting and shortening the passage between the tongue and the roof of the mouth and palate. If we would suppose that the passage from the vocal cords to the lips were a tube, then we could say that in *u* the passage was the longest and in *i* the shortest, and the *o*, *a* and *e* sounds intermediate between these in the order stated. In these and in the examples which follow, it would be well for the reader to test the methods described, which would do much to make this subject more easily understood.

The consonants, as their name implies, can not be sounded alone but simply modify the vowel sounds. This may be done by the lips (*labial*), the teeth (*dental*), the tongue (*lingual*), the palate (*palatal*) or by allowing the air to pass through the nostrils (*nasal*). The simplest are the labial sounds (*m, b, p, f, v, w*), and these are therefore, the first learned in infancy, as 'mama,' 'papa,' etc. In sounding the vowel *a*, we first contract the lips and then allow the air to escape by opening them, the slight explosive sound forms 'ba,' and if this effort is made stronger, it becomes 'pa.' In the dental sounds (*t, d, s*, etc.), the emission of the vowel is made by the teeth and tip of the tongue, and in the palatal (*k, g, c*, etc.), by means of the middle or posterior portion of the tongue and the middle or posterior portion of the palate. In this position are formed the so-called 'guttural' sounds of the German (*ich, doch*, etc.) which forms one of the characteristics of this language.

FIG. 7. DIAGRAM OF VOCAL APPARATUS DURING PRONUNCIATION OF THE NASAL SOUND 'N' (GUTTMAN).

In the above described consonant sounds, the emission of air through the nostrils has been prevented by the soft palate being brought against the back of the throat. In the nasal sounds (*n, ng*), however, the air is allowed to pass through the nostrils by relaxing the soft palate. If the nostril be closed when 'ing,' for instance, is to be pronounced, the sound will not issue unless the air be allowed to pass through the nostrils. In some cases, the nasal sound is given to words to which it does not belong, this giving a peculiar nasality of tone easily recognized. In the French, there are normally the 'nasal vowels' (*in, en, on*) characteristic of this language.

In addition to the above, we have the *aspirate*, represented by the letter *h*. In this, a partial expiration is first allowed to pass between the vocal cords before they are approximated to form the vowel, in this way changing the *a* to *'ha'* and *o* to *'ho.'* This sound is pronounced very distinctly in the German language, less so in the English, being

occasionally omitted as in the words 'heir,' 'humor,' etc., and infrequent in the French and quite softly when pronounced.

The aspirate, which is sounded without approximating the vocal cords, brings us to the *whisper* in which we have all the elements of speech without the initial vibrations of the vocal cords. That these are not concerned in the whisper is demonstrated by the fact that persons, suffering from such forms of paralysis that the cords can not be brought together, can whisper, and that even where the vocal cords have been entirely destroyed by tuberculous or other disease, the patient can still whisper without difficulty.

As already stated, the modifications of the vowel sounds for articulate speech are made in the cavities of the mouth, the upper part of the throat and by the nostrils, and are further modified by the position of the teeth, lips and palate. In perfect singing or speaking, we must have all these parts in a normal condition, and where there is no obstruction, defect, congestion or inflammation, there is no interference with the free motion or vibration of the parts concerned in voice production.

The question may be asked how this information about the action of the vocal cords has been learned, since, during life, they are out of sight. The use of a mirror by the throat specialist is now so common that it no longer attracts any comment, although this method of examining the larynx of a living subject is yet comparatively recent. The method, however, by means of which these parts are inspected is not so well understood, and it would, therefore, be not without interest to explain it.

FIG. 8. METHOD OF EXAMINING LARYNX, THE VIEW OF WHICH IS SHOWN IN THE SMALL CUT AT THE LEFT (INGALS).

The interior of the larynx, being separated from without by its skin and cartilages, is, of course, dark, and must therefore first be illuminated in order to be seen. A small mirror is therefore placed in the back part of the throat, which projects the rays of light downwards into the parts to be inspected. In order to enable the operator to use the same mirror for inspecting as for illuminating the larynx, he fastens to his forehead a concave mirror which reflects the condensed light to the throat mirror, and by means of an opening in the center of the head mirror, he is enabled to see the parts of the throat that are illuminated by the throat mirror. This arrangement, which is comparatively simple, has been the foundation of the science of

laryngology, as, before its invention, the investigations of the larynx were limited to the examination of the dead body, and many of the most important diseases escaped observation.

The study of the action of the vocal cords during speaking or singing is somewhat more complicated. We have already stated that in order to produce a tone, the rate of vibration must be at least 18 to the second, and the lowest tone of the human voice (low *D* of the bass) rarely falls below 73 vibrations per second. Ordinarily, then, it would be impossible to see the motion of the vocal cords during vibration, and yet this is an important matter. Human ingenuity has come to the relief of this problem in the invention of an instrument called the 'stroboscope' which is here shown.

In explaining its mechanism let us imagine a carriage wheel with a number on each spoke, the wheel being in rapid revolution around its axis. Ordinarily these numbers would be entirely obscured on account of the rapidity of the motion, and would present to the eye simply a blur. If, however, we place in front of this wheel a large piece of pasteboard with an opening opposite to one of these numbers, and some mechanism in front of this hole so that it would open only when the same number is in front of it, then we could inspect them one by one by a simple adjustment. Furthermore, it could be so arranged that instead of opening always at the same number, it would miss one revolution and open at the second number, and in this way we could see each number until the whole series had passed.

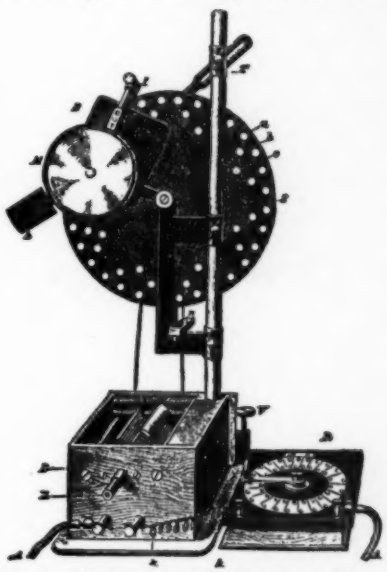


FIG. 9. STROBOSCOPE FOR EXAMINING VOCAL CORDS DURING VIBRATION.

This is the principle involved in the stroboscope. The patient is instructed to give a certain tone, and by means of a syren, which indicates the number of vibrations for any given tone, the number of vibrations per second are registered. This instrument is then so adjusted that the aperture, by means of which the vocal cords are examined, opens after every series of vibrations are complete so that the vocal cords are always in the same position. This inspection of the larynx is conducted in the same manner as with the mirror method already described.

In this way the vocal cords may be seen in any stage of their vibrations, and the instrument may also be so adjusted that one series of vibrations is omitted, and the second step of the vibration is taken up, so that we apparently have a slow motion of the vocal cords, which enables us to study their action during voice production. This has given us much useful information, especially regarding the subject of the various registers of the human voice.

Having now explained the production of the voice under normal conditions, I must now show how this is affected by abnormal conditions, and also point out some suggestions as to the care of this important organ. You will remember that the vibrations of the vocal cords produce the fundamental elements of the voice. Any condition which prevents their free vibration will therefore interfere with the normal voice. The most frequent disturbances are due to 'colds' in which the vocal cords may become congested or inflamed. This produces a thickening of the vocal cords which lowers their rate of vibration, and, consequently, lowers the tone and gives rise to the hoarse voice characteristic of an ordinary cold. When this condition, from any cause, becomes chronic so that instead of a simple swelling of the vocal cords we have a chronic thickening, it may leave, unless corrected, a permanent defect in the voice.

A more serious influence on the voice is due to growths or tumors either on the vocal cords or in some other part of the throat, and interfering with the formation of vocal sounds. In the adjoining illustration, the small tumor shown between the vocal cords had caused hoarseness by interfering with the vibrations of the vocal cords, and by irritating the throat had set up a persistent cough. About eighteen months before being seen, the patient had leaped into the Mississippi River to save a child from drowning. The exposure was followed by a severe cold, leaving a persistent hoarseness, afterwards accompanied by a cough. About a year and a half afterwards, the patient was sent to me and a careful examination revealed this small tumor on the vocal cord, which affected his speech, so that it was of an extremely husky character. The following day this tumor was removed by means of an instrument passed from the mouth into the throat, the course of the operation being followed by means of a mirror as already explained, and being rendered painless by the application of cocaine, and the tumor removed. The voice being freed from the dampening

FIG. 10. SMALL TUMOR OF VOCAL CORD INTERFERING WITH VOICE PRODUCTION.

influence of the growth, was restored immediately, and the cough disappeared a few days later.

A still more serious injury to the vocal cords is due to ulceration which has destroyed some part of the vocal cord. A defect of this kind is irreparable. When an arm is diseased, no matter how seriously, there is always a possibility of saving it, but when the arm is cut off, its usefulness is ended. This is also the case with the vocal cords. By means of training, the voice may to some extent be improved, but it will always be more or less affected when there has been a loss of substance.

Paralytic conditions also have a marked effect on the voice. As already explained, in the production of sound the edges of the vocal cords are brought together. In cases of paralysis, if one or both vocal cords can not be brought to the middle line, the space is too large to resist the column of air from the lungs for setting the vocal cords in vibration, and there is no voice. In some cases, where the paralysis is on one side and not too great, the remaining vocal cord may be gradually trained to be brought over to the other side, and in this case the voice may be recovered, otherwise it will be simply a whisper. Some cases of paralysis involve only the muscles which contract the vocal cords, thus preventing tension and causing hoarseness. As there is no loss of substance in paralysis, the prospects for recovery of the voice, except in certain cases, is good.

As we have already explained, the principal parts concerned in the modification of speech are the lips, teeth, tongue, palate and nostrils, and any defect in these will influence voice production. Some defects are easily recognized, as for instance the tie-tongue, in which the band, which connects the tip of the tongue with the floor of the mouth, is too short and prevents the tongue from being brought forward in certain sounds, thus giving rise to the defect characteristic of this condition. This defect is easily rectified by a slight operation, and, unless the muscles of the tongue are otherwise defective, restoration of normal speech eventually ensues.

It must be remembered, however, that in children who have for years been accustomed to this defective method of speech, the muscles have adapted themselves to the changed condition, and a complete correction of the defective speech is a question of time. I remember an occasion, for instance, when a mother returned to me after this simple operation had been done, and complained that it had been a total failure, giving as her reason that the child's speech was just as defective as before the operation. I explained to her what I have just said, and instructed her to teach the child to use its tongue in its normal position, and this exercise was followed in a few months by an entire correction of the defect.

Missing or broken teeth, especially in the case of the front teeth which are more concerned in voice production, give rise to defects which are corrected when the teeth are replaced or repaired.

A catarrhal condition in the upper part of the throat, filling it with secretion, interferes with the free vibration of sound and gives an effect very similar to that due to an obstruction in the rear portion of the nostrils, as is sometimes the case in the later stage of a severe cold.

There seems to be much misconception regarding the tonsils as a factor in voice production. It is of common occurrence for mothers to ask the physician before an operation upon the tonsil if it will not injure the voice. As a matter of fact, the healthy tonsil has no effect upon the voice, while the diseased tonsil can have only an injurious effect either directly by its size, interfering with the free vibration of the voice, or indirectly by setting up an irritation of the throat and causing the voice to be weak. The correction, or even removal, of a diseased tonsil can, therefore, have only a good influence on the voice.

There is another unhealthy condition of the throat of children which is now receiving more attention, due to the so-called 'adenoids.' In this there is an enlargement of the tissues in that part of the throat just back of the nostrils. This growth may interfere with speech either on account of the secretion which it produces or by its size, in either case obstructing the entrance of the nasal sounds into the nostril. The presence of this abnormal growth is injurious not only on account of its effect on the voice but also on the general health, as it prevents the child from breathing in the manner intended by nature, that is through the nostrils.

The nostrils are not simply openings for allowing the air to reach the lungs, but their special function is to warm, clean and moisten the air which is intended for respiration. Proof of this is shown by the fact that if we suffer from a 'cold' so that the nostrils are obstructed, an irritated throat is a certain result the next morning, being due to the fact that the unprepared air has irritated the delicate tissues of the throat. In diphtheria, for instance, if the membrane has developed in the throat and threatens the breathing of the child, and this be overcome by a tube inserted in the throat below the false membrane, respiration must now go on without the air passing through the nasal passages. The only way to counteract the evil effects of this abnormal breathing is to place the child in a room which is warmed to almost the normal temperature of the body, artificially saturated with moisture, and every endeavor made to keep it free from impurities. Even with this, the patient may develop a bronchial affection due to the absence of nasal breathing, but without it, a bronchitis, even of a fatal character, would develop in a short time. I go to some length

in explaining this matter, as the importance of the nose in respiration is not well understood. Its influence on the speech is better recognized, as most persons easily note the peculiar effect on the speech when there is an obstruction in the nasal passages.

Having now given you a description of the organs of speech in health and in disease, a few words as to its care will conclude this article. In this as in other parts of the human body, prevention is better than cure. Careful attention to any abnormal condition of the nose or throat is an effective means of preventing any disease of these parts. The same rule, which applies to other parts of the body, such as the necessity of outdoor exercise, fresh air, etc., is in general applicable here, and perhaps a little more here because the nose and throat form the vanguard of the respiration so essential to life. Any agent which irritates the delicate membrane of the throat is injurious to the voice—among these may be mentioned the use of strong liquor and the abuse of smoking, especially cigarettes. The action of the cigarette tends to produce a chronic irritation and thickening of the throat, sometimes accompanied by excessive dryness and irritability, these causing efforts to clear the throat which adds to the injurious effect. The remedy is evident.

The correct placing of the voice is of the utmost importance. No attempt should be made to do this until the voice is properly developed, and this should not be done by singing or even solfeggio practice, but by vocal exercises on the vowel sounds, especially of *a* (as in 'maw'). I have seen many voices greatly injured and even permanently ruined by being placed in the wrong class, even such egregious errors as a bass, classified as a tenor, being among the cases which I have had to treat.

The strengthening of the throat by means of vocal exercise is as important as the strengthening of the body by suitable physical exercise. Teachers and lawyers, therefore, as well as singers should practise certain vocal exercises such as loud reading, light vocal scales, etc., so that, when called upon to make a special use of the voice, it is prepared by regular practise for this unusual exertion.

WHAT KNOWLEDGE IS OF MOST WORTH?*

BY THE LATE HERBERT SPENCER.

IT has been truly remarked that, in order of time, decoration precedes dress. Among people who submit to great physical suffering that they may have themselves handsomely tattooed, extremes of temperature are borne with but little attempt at mitigation. Humboldt tells us that an Orinoco Indian, though quite regardless of bodily comfort, will yet labor for a fortnight to purchase pigment wherewith to make himself admired; and that the same woman who would not hesitate to leave her hut without a fragment of clothing on, would not dare to commit such a breach of decorum as to go out unpainted. Voyagers uniformly find that colored beads and trinkets are much more prized by wild tribes than are calicoes or broadcloths. And the anecdotes we have of the ways in which, when shirts and coats are given, they turn them to some ludicrous display, show how completely the idea of ornament predominates over that of use. Nay, there are still more extreme illustrations: witness the fact narrated by Captain Speke of his African attendants, who strutted about in their goat-skin mantles when the weather was fine, but when it was wet, took them off, folded them up, and went about naked, shivering in the rain! Indeed, the facts of aboriginal life seem to indicate that dress is developed out of decorations. And when we remember that even among ourselves most think more about the fineness of the fabric than its warmth, and more about the cut than the convenience—when we see that the function is still in great measure subordinated to the appearance—we have further reason for inferring such an origin.

It is not a little curious that the like relations hold with the mind. Among mental as among bodily acquisitions, the ornamental comes before the useful. Not only in times past, but almost as much in our own era, that knowledge which conduces to personal well-being has been postponed to that which brings applause. In the Greek schools, music, poetry, rhetoric, and a philosophy which, until Socrates taught, had but little bearing upon action, were the dominant subjects; while knowledge aiding the arts of life had a very subordinate place. And in our own universities and schools at the present moment the like

* The opening and concluding parts of an article originally printed in the *Westminster Review* and republished by Messrs. D. Appleton and Co. in 1860, with other papers, in a volume entitled 'Education.'

antithesis holds. We are guilty of something like a platitude when we say that throughout his after-career a boy, in nine cases out of ten, applies his Latin and Greek to no practical purposes. The remark is trite that in his shop, or his office, in managing his estate or his family, in playing his part as director of a bank or a railway, he is very little aided by this knowledge he took so many years to acquire—so little, that generally the greater part of it drops out of his memory; and if he occasionally vents a Latin quotation, or alludes to some Greek myth, it is less to throw light on the topic in hand than for the sake of effect. If we inquire what is the real motive for giving boys a classical education, we find it to be simply conformity to public opinion. Men dress their children's minds as they do their bodies, in the prevailing fashion. As the Orinoco Indian puts on his paint before leaving his hut, not with a view to any direct benefit, but because he would be ashamed to be seen without it; so, a boy's drilling in Latin and Greek is insisted on, not because of their intrinsic value, but that he may not be disgraced by being found ignorant of them—that he may have 'the education of a gentleman'—the badge marking a certain social position, and bringing a consequent respect.

This parallel is still more clearly displayed in the case of the other sex. In the treatment of both mind and body, the decorative element has continued to predominate in a greater degree among women than among men. Originally, personal adornment occupied the attention of both sexes equally. In these latter days of civilization, however, we see that in the dress of men the regard for appearance has in a considerable degree yielded to the regard for comfort; while in their education the useful has of late been trenching on the ornamental. In neither direction has this change gone so far with women. The wearing of ear-rings, finger-rings, bracelets; the elaborate dressings of the hair; the still occasional use of paint; the immense labor bestowed in making habiliments sufficiently attractive; and the great discomfort that will be submitted to for the sake of conformity; show how greatly, in the attiring of women, the desire of approbation overrides the desire for warmth and convenience. And similarly in their education, the immense preponderance of 'accomplishments' proves how here, too, use is subordinated to display. Dancing, deportment, the piano, singing, drawing—what a large space do these occupy! If you ask why Italian and German are learnt, you will find that, under all the sham reasons given, the real reason is, that a knowledge of those tongues is thought ladylike. It is not that the books written in them may be utilized, which they scarcely ever are; but that Italian and German songs may be sung, and that the extent of attainment may bring whispered admiration. The births, deaths, and marriages of kings, and other like historic trivialities, are committed to memory, not be-

cause of any direct benefits that can possibly result from knowing them; but because society considers them parts of a good education—because the absence of such knowledge may bring the contempt of others. When we have named reading, writing, spelling, grammar, arithmetic, and sewing, we have named about all the things a girl is taught with a view to their direct uses in life; and even some of these have more reference to the good opinion of others than to personal welfare.

Thoroughly to realize the truth that with the mind as with the body the ornamental precedes the useful, it is needful to glance at its rationale. This lies in the fact that, from the far past down even to the present, social needs have subordinated individual needs, and that the chief social need has been the control of individuals. It is not, as we commonly suppose, that there are no governments but those of monarchs, and parliaments, and constituted authorities. These acknowledged governments are supplemented by other unacknowledged ones, that grow up in all circles, in which every man or woman strives to be king or queen or lesser dignitary. To get above some and be reverenced by them, and to propitiate those who are above us, is the universal struggle in which the chief energies of life are expended. By the accumulation of wealth, by style of living, by beauty of dress, by display of knowledge or intellect, each tries to subjugate others; and so aids in weaving that ramified network of restraints by which society is kept in order. It is not the savage chief only, who, in formidable war-paint, with scalps at his belt aims to strike awe into his inferiors; it is not only the belle who, by elaborate toilet, polished manners, and numerous accomplishments, strives to 'make conquests'; but the scholar, the historian, the philosopher, use their acquirements to the same end. We are none of us content with quietly unfolding our own individualities to the full in all directions; but have a restless craving to impress our individualities upon others, and in some way subordinate them. And this it is which determines the character of our education. Not what knowledge is of most real worth, is the consideration; but what will bring most applause, honor, respect—what will most conduce to social position and influence—what will be most imposing. As, throughout life, not what we are, but what we shall be thought, is the question; so in education, the question is, not the intrinsic value of knowledge, so much as its extrinsic effects on others. And this being our dominant idea, direct utility is scarcely more regarded than by the barbarian when filing his teeth and staining his nails.

* * *

Thus far our question has been, the worth of knowledge of this or that kind for purposes of guidance. We have now to judge the relative values of different kinds of knowledge for purposes of discipline. This division of our subject we are obliged to treat with comparative

brevity; and happily, no very lengthened treatment of it is needed. Having found what is best for the one end, we have by implication found what is best for the other. We may be quite sure that the acquirement of those classes of facts which are most useful for regulating conduct, involves a mental exercise best fitted for strengthening the faculties. It would be utterly contrary to the beautiful economy of Nature, if one kind of culture were needed for the gaining of information and another kind were needed as a mental gymnastic. Everywhere throughout creation we find faculties developed through the performance of those functions which it is their office to perform; not through the performance of artificial exercises devised to fit them for these functions. The Red Indian acquires the swiftness and agility which make him a successful hunter, by the actual pursuit of animals; and by the miscellaneous activities of his life, he gains a better balance of physical powers than gymnastics ever give. That skill in tracking enemies and prey which he has reached by long practice, implies a subtlety of perception far exceeding anything produced by artificial training. And similarly throughout. From the Bushman, whose eye, which being habitually employed in identifying distant objects that are to be pursued or fled from, has acquired a quite telescopic range, to the accountant whose daily practice enables him to add up several columns of figures simultaneously, we find that the highest power of a faculty results from the discharge of those duties which the conditions of life require it to discharge. And we may be certain, *à priori*, that the same law holds throughout education. The education of most value for guidance, must at the same time be the education of most value for discipline. Let us consider the evidence.

One advantage claimed for that devotion to language-learning which forms so prominent a feature in the ordinary *curriculum*, is, that the memory is thereby strengthened. And it is apparently assumed that this is an advantage peculiar to the study of words. But the truth is, that the sciences afford far wider fields for the exercise of memory. It is no slight task to remember all the facts ascertained respecting our solar system; much more to remember all that is known concerning the structure of our galaxy. The new compounds which chemistry daily accumulates, are so numerous that few, save professors, know the names of them all; and to recollect the atomic constitutions and affinities of all these compounds, is scarcely possible without making chemistry the occupation of life. In the enormous mass of phenomena presented by the Earth's crust, and in the still more enormous mass of phenomena presented by the fossils it contains, there is matter which it takes the geological student years of application to master. In each leading division of physics—sound, heat, light, electricity—the facts are numerous enough to alarm any one proposing to learn

them all. And when we pass to the organic sciences, the effort of memory required becomes still greater. In human anatomy alone, the quantity of detail is so great, that the young surgeon has commonly to get it up half a dozen times before he can permanently retain it. The number of species of plants which botanists distinguish, amounts to some 320,000; while the varied forms of animal life with which the zoologist deals, are estimated at some two millions. So vast is the accumulation of facts which men of science have before them, that only by dividing and subdividing their labors can they deal with it. To a complete knowledge of his own division, each adds but a general knowledge of the rest. Surely, then, science, cultivated even to a very moderate extent, affords adequate exercise for memory. To say the very least it involves quite as good a training for this faculty as language does.

But now mark that while for the training of mere memory, science is as good as, if not better than, language; it has an immense superiority in the kind of memory it cultivates. In the acquirement of a language, the connexions of ideas to be established in the mind correspond to facts that are in great measure accidental; whereas, in the acquirement of science, the connexions of ideas to be established in the mind correspond to facts that are mostly necessary. It is true that the relations of words to their meaning is in one sense natural, and that the genesis of these relations may be traced back a certain distance; though very rarely to the beginning; (to which let us add the remark that the laws of this genesis form a branch of mental science—the science of philology). But since it will not be contended that in the acquisition of languages, as ordinarily carried on, these natural relations between words and their meanings are habitually traced, and the laws regulating them explained; it must be admitted that they are commonly learned as fortuitous relations. On the other hand, the relations which science presents are casual relations; and, when properly taught, are understood as such. Instead of being practically accidental, they are necessary; and as such, give exercise to the reasoning faculties. While language familiarizes with non-rational relations, science familiarizes with rational relations. While the one exercises memory only, the other exercises both memory and understanding.

Observe next that a great superiority of science over language as a means of discipline, is, that it cultivates the judgment. As, in a lecture on mental education delivered at the Royal Institution, Professor Faraday well remarks, the most common intellectual fault is deficiency of judgment. He contends that 'society, speaking generally, is not only ignorant as respects education of the judgment, but it is also ignorant of its ignorance.' And the cause to which he ascribes this state is want of scientific culture. The truth of his conclusion is obvious.

Correct judgment with regard to all surrounding things, events, and consequences, becomes possible only through knowledge of the way in which surrounding phenomena depend on each other. No extent of acquaintance with the meanings of words, can give the power of forming correct inferences respecting causes and effects. The constant habit of drawing conclusions from data, and then of verifying those conclusions by observation and experiment, can alone give the power of judging correctly. And that it necessitates this habit is one of the immense advantages of science.

Not only, however, for intellectual discipline is science the best; but also for *moral* discipline. The learning of languages tends, if anything, further to increase the already undue respect for authority. Such and such are the meanings of these words, says the teacher or the dictionary. So and so is the rule in this case, says the grammar. By the pupil these dicta are received as unquestionable. His constant attitude of mind is that of submission to dogmatic teaching. And a necessary result is a tendency to accept without inquiry whatever is established. Quite opposite is the attitude of mind generated by the cultivation of science. By science, constant appeal is made to individual reason. Its truths are not accepted upon authority alone; but all are at liberty to test them—nay, in many cases, the pupil is required to think out his own conclusions. Every step in a scientific investigation is submitted to his judgment. He is not asked to admit it without seeing it to be true. And the trust in his own powers thus produced, is further increased by the constancy with which Nature justifies his conclusions when they are correctly drawn. From all which there flows that independence which is a most valuable element in character. Nor is this the only moral benefit bequeathed by scientific culture. When carried on, as it should always be, as much as possible under the form of independent research, it exercises perseverance and sincerity. As says Professor Tyndall of inductive inquiry, "it requires patient industry, and an humble and conscientious acceptance of what Nature reveals. The first condition of success is an honest receptivity and a willingness to abandon all preconceived notions, however cherished, if they be found to contradict the truth. Believe me, a self-renunciation which has something noble in it, and of which the world never hears, is often enacted in the private experience of the true votary of science."

Lastly we have to assert—and the assertion will, we doubt not, cause extreme surprise—that the discipline of science is superior to that of our ordinary education, because of the *religious* culture that it gives. Of course we do not here use the words scientific and religious in their ordinary limited acceptations; but in their widest and highest acceptations. Doubtless, to the superstitions that pass under the name of

religion, science is antagonistic; but not to the essential religion which these superstitions merely hide. Doubtless, too, in much of the science that is current, there is a pervading spirit of irreligion; but not in that true science which has passed beyond the superficial into the profound.

True science and true religion, says Professor Huxley at the close of a recent course of lectures, are twin-sisters, and the separation of either from the other is sure to prove the death of both. Science prospers exactly in proportion as it is religious; and religion flourishes in exact proportion to the scientific depth and firmness of its basis. The great deeds of philosophers have been less the fruit of their intellect than of the direction of that intellect by an eminently religious tone of mind. Truth has yielded herself rather to their patience, their love, their single-heartedness, and their self-denial, than to their logical acumen.

* * *

We conclude, then, that for discipline, as well as for guidance, science is of chiefest value. In all its effects, learning the meanings of things, is better than learning the meanings of words. Whether for intellectual, moral, or religious training, the study of surrounding phenomena is immensely superior to the study of grammars and lexicons.

Thus to the question with which we set out—What knowledge is of most worth?—the uniform reply is—Science. This is the verdict on all the counts. For direct self-preservation, or the maintenance of life and health, the all-important knowledge is—Science. For that indirect self-preservation which we call gaining a livelihood, the knowledge of greatest value is—Science. For the due discharge of parental functions, the proper guidance is to be found only in—Science. For that interpretation of national life, past and present, without which the citizen can not rightly regulate his conduct, the indispensable key is—Science. Alike for the most perfect production and highest enjoyment of art in all its forms, the needful preparation is still—Science. And for purposes of discipline—intellectual, moral, religious—the most efficient study is, once more—Science. The question which at first seemed so perplexed, has become, in the course of our inquiry, comparatively simple. We have not to estimate the degrees of importance of different orders of human activity, and different studies as severally fitting us for them; since we find that the study of Science, in its most comprehensive meaning, is the best preparation for all these orders of activity. We have not to decide between the claims of knowledge of great though conventional value, and knowledge of less though intrinsic value; seeing that the knowledge which we find to be of most value in all other respects, is intrinsically most valuable: its worth is not dependent upon opinion, but is as fixed as is the relation of man to the surrounding

world. Necessary and eternal as are its truths, all Science concerns all mankind for all time. Equally at present, and in the remotest future, must it be of incalculable importance for the regulation of their conduct, that men should understand the science of life, physical, mental, and social; and that they should understand all other science as a key to the science of life.

And yet the knowledge which is of such transcendent value is that which, in our age of boasted education, receives the least attention. While this which we call civilization could never have arisen had it not been for science; science forms scarcely an appreciable element in what men consider civilized training. Though to the progress of science we owe it, that millions find support where once there was food only for thousands; yet of these millions but a few thousands pay any respect to that which has made their existence possible. Though this increasing knowledge of the properties and relations of things has not only enabled wandering tribes to grow into populous nations, but has given to the countless members of those populous nations comforts and pleasures which their few naked ancestors never even conceived, or could have believed, yet is this kind of knowledge only now receiving a grudging recognition in our highest educational institutions. To the slowly growing acquaintance with the uniform co-existences and sequences of phenomena—to the establishment of invariable laws, we owe our emancipation from the grossest superstitions. But for science we should be still worshipping fetishes; or, with hecatombs of victims, propitiating diabolical deities. And yet this science, which, in place of the most degrading conceptions of things, has given us some insight into the grandeurs of creation, is written against in our theologies and frowned upon from our pulpits.

Paraphrasing an Eastern fable, we may say that in the family of knowledges, Science is the household drudge, who, in obscurity, hides unrecognized perfections. To her has been committed all the work; by her skill, intelligence, and devotion, have all the conveniences and gratifications been obtained; and while ceaselessly occupied ministering to the rest, she has been kept in the background, that her haughty sisters might flaunt their fripperies in the eyes of the world. The parallel holds yet further. For we are fast coming to the *dénouement*, when the positions will be changed; and while these haughty sisters sink into merited neglect, Science, proclaimed as highest alike in worth and beauty, will reign supreme.

THE PROGRESS OF SCIENCE.

HERBERT SPENCER.

THE world loses one of its few great men in the death of Herbert Spencer. Thirty years ago there lived and worked in Great Britain a notable group of leaders—Darwin, Huxley, Browning, Tennyson, Carlyle, Ruskin, Thackeray, Gladstone and many more. One by one they have died, each time leaving an empty space that remains unfilled. We have still Kelvin, Watts, Swinburne and Meredith, but the voices of the Victorian era are now nearly silent. It is perhaps needful to go back to the Elizabethan age for a period of parallel efflorescence; and it may be that such will not again recur even after three hundred years.

Spencer believed in universal evolution rather than in miracles wrought by the individual; and it is certainly true that his own work was the result rather than the cause of certain leading tendencies of the nineteenth century. Evolution and the conservation of energy are the great legacy handed on to the twentieth century, no longer speculations of the philosophers, but part of the real life of every one. Spencer more completely and more perfectly than any other represented these truths and made them our common heritage. In the preface to the fourth edition of the 'First Principles,' he explains that the doctrine of evolution was maintained by him two or even four years before the publication of the 'Origin of Species.' As a matter of fact the idea of world evolution goes back almost to the beginning of thought; it is clearly stated for inorganic matter and living things by the Greek philosophers and again by Kant, Laplace, Goethe and Lamarck. It is a question whether even Darwin's 'natural selection,' which does not after all play a leading part in Spencer's philosophy, can not be found in Aristotle. Evolution was clearly 'in the air' in the middle decades of the nineteenth century. Thus before Darwin or Spencer, Tennyson wrote and printed the fine verses:

'So careful of the type?' but no.
From scarped cliff and quarried stone
She cries, 'A thousand types are gone:
I care for nothing, all shall go.'

* * * * * *

The solid earth whereon we tread
In tracts of fluent heat began,
And grew to seeming random forms,
The seeming prey of cyclic storms,
Till at the last arose the man.

Of these ideas Spencer became the leading representative, his bold formulas appealing directly to the people to an extent that could not be expected of Darwin's patient investigations. The methods of the two men are compared in a letter from Darwin to John Fiske:

I find that my mind is so fixed by the inductive method that I can not appreciate deductive reasoning: I must begin with a good body of facts and not from a principle (in which I always suspect some fallacy) and then as much deduction as you please. This may be very narrow-minded; but the result is that such parts of H. Spencer as I have read with care impress my mind with the idea of his inexhaustible wealth of suggestion, but never convince me.

If others were as frank as Darwin, many would say with him: "With the exception of special points I did not even understand H. Spencer's general doctrine; for his style is too hard work for me." But Spencer appealed to the emotions as well as to the intellect.

His work justified the abandonment of certain narrow dogmas, which left an exhilarating sense of emancipation. There was more truly a Spencerian religion than any resulting from the positivism of Comte. This was particularly the case in America, and THE POPULAR SCIENCE MONTHLY was largely responsible. Spencer opened the first volume in 1872, and contributed in all ninety-one articles. The editorial writings of E. L. and W. J. Youmans were always enthusiastically loyal to the Spencerian doctrines and the Spencerian religion. No greater service could at the time have been performed for the freedom of thought and the progress of civilization.

But the great representative of evolution, though he may be interpreted as regarding his own doctrines as final, must surely have rejoiced in the further progress of science and of thought. His works on biology and on psychology have been superseded. He clearly represented the conflicting tendencies of his age. He devoted his life to what is perhaps the last great system of synthetic philosophy, when the inductive sciences were becoming predominant. He was an ardent individualist, while advocating a theory that subordinates the individual to the world pattern. He leaves the problems of idealism and materialism face to face.

It is not necessary to enter here into details in regard to Spencer's life. Very characteristically he has left his autobiography stereotyped and ready for the press. A sketch with his portrait will be found in the issue of this magazine for March, 1876. We reproduce as a frontispiece, by the courtesy of Messrs. D. Appleton and Company, an engraving of a bust of Spencer at the age of seventy-six, modeled by Mr. Onslow Ford and presented to him by his admirers. Spencer's life was at once formal and heroic. Burdened by ill-health and comparative poverty, he would dictate to an amanuensis for fifteen minutes at a time, resulting in a productivity of some 300 words a day. Without family or intimate friends, he led a lonely life. But he never faltered in his devotion to his plans and ideals. After eighty-three years he is now dead; but his work is immortal, not only in the history of thought, but also in

> The choir invisible
> Whose music is the gladness of the world.

THE CONVOCATION WEEK MEETINGS OF SCIENTIFIC SOCIETIES.

THOSE readers of this journal who are interested in the organization of science will remember that American scientific societies and institutions of learning have set aside the week in which the first day of January falls as a time of convocation for scientific meetings. Until last year the American Association for the Advancement of Science and its affiliated societies met in midsummer, while the American Society of Naturalists and a number of societies devoted to the biological sciences met in the Christmas holidays. Certain societies, such as the American Chemical Society and the Geological Society of America, held meetings at both times. All these societies met together last year at Washington during convocation week, making the largest and most influential gathering of scientific men that this country has witnessed.

There will this year be a certain amount of division. The American Association and the Naturalists with twenty affiliated societies will meet at St. Louis. The Zoologists and four other societies concerned with biology will meet at Philadelphia, and the Philosophical Association will meet at Princeton. The Economists and Historians, who have not as yet become affiliated with the scientific societies, will meet at New Orleans. It seems evident that the American Association must be a national organization and that there should be societies for the different sciences which are national in scope. Owing to the great area of the country

these societies must be broken up into sections; but the most efficient form of organization has still to be worked out. A general meeting of the scientific men of the country appears to be essential; but it is possible that this can only take place once in three years, the meetings being more local in the intervening years. There should, however, be one central place of meeting each year, where the societies of the whole country can be represented by delegates, should a plebiscite be impossible. It has been agreed that for the present this general meeting should be in the eastern states twice and in the central or western states once in three years.

The general meeting is this year at St. Louis, and it will doubtless rival in interest and importance the Washington meeting. Counting the sections of the American Association, there will be at least thirty scientific organizations in session, and the officers alone make a representative body of scientific men. The Hon. Carroll D. Wright, U. S. Commissioner of Labor and president of Clark College, presides over the association, and Dr. Ira Remsen, president of the Johns Hopkins University, gives the address of the retiring president. Professor William Trelease, director of the Missouri Botanical Gardens, gives the presidential address before the Society of Naturalists, and the public lecture is to be delivered by President David Starr Jordan of Stanford University. It would require many pages to give details of the programs; they will be found in part in recent numbers of *Science* and in the local program issued by the association. The latter can be obtained from the permanent secretary, Dr. L. O. Howard, Cosmos Club, Washington, D. C., to whom also applications for membership should be addressed. All scientific workers in the central states and also those interested in science not now members should make the St. Louis meeting the occasion of acquiring membership.

CENTRAL HIGH SCHOOL, IN WHICH THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND AFFILIATED SOCIETIES WILL MEET DURING CONVOCATION WEEK.

THE CARNEGIE INSTITUTION.

THE trustees of the Carnegie Institution held their second annual meeting at Washington on December 9. Nothing that has become known in regard to this meeting will tend to allay the anxiety with which men of science are watching the administration of this great trust. It is reported that Dr. Gilman presented a letter to the trustees announcing his intention to resign the presidency at the close of next year. The institution will consequently drift along for another year, and its immediate future will in large measure depend on the president then chosen. There is no reason to doubt the ultimate outcome, and even the present conditions are only what might have been expected. Special creations are no longer regarded as feasible. The reply may be called to mind of the little boy, who on being asked who made him, said 'God made me one foot big, and I growed the rest.' A new foundation such as Mr. Carnegie's can only gradually become a true organism adjusted to the environment.

Mr. Carnegie's original plan of establishing a research university at Washington was comparatively plain sailing. The trustees are now divided as to policy, some wishing to establish certain laboratories at Washington, and others perferring to distribute subsidies throughout the country. The latter plan has been adopted; it has the obvious advantage of not committing the institution as to the future. No special objection can be made to the way the subsidies have been allotted. It is quite certain, for example, that the Harvard, Lick, Yerkes, Dudley and Princeton Observatories can spend to advantage any money that may be entrusted to them. Almost any grant for research made to men of science of established reputation will bear fruit a hundredfold. There is, however, an obverse to the shield. Such grants inhibit individual initiative and local support; they are likely to produce a certain subserviency to the powers that deal out money, and may lead to jealousy and intrigues.

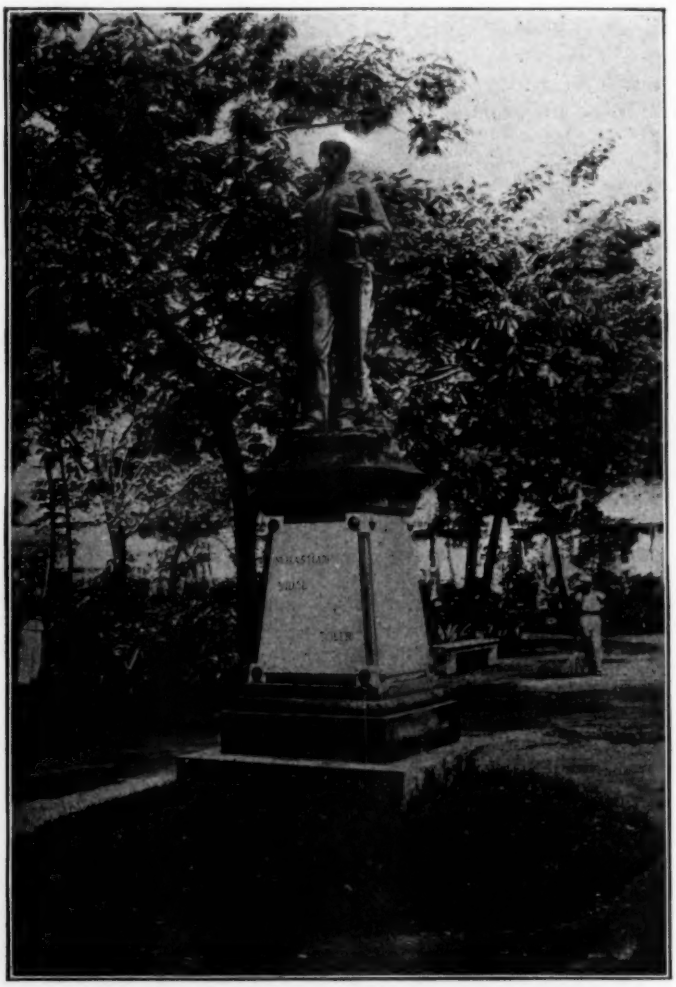
It is perhaps scarcely fair to object to a board of trustees consisting chiefly of prominent politicians, lawyers and business men, who meet once a year, and can not be expected to give much attention to the affairs of a scientific institution, nor to have much knowledge of its scope and possibilities. Such boards are an established American institution, controlling universities, banks, etc. Their principal duty is to select efficient officers of administration. But the Carnegie Institution has been unfortunate in its first officers. Three men were largely instrumental in persuading Mr. Carnegie to make the original gift, and they have assumed control of its administration. This triumvirate has been at the same time autocratic and feeble, and has by no means worked in harmony. Antony may be supposed to say to Octavius:

> And though we lay these honors on this man,
> To ease ourselves of divers sland'rous loads,
> He shall but bear them as the ass bears gold,
> To groan and sweat under the business,
> Either led or driven, as we point the way;
> And having brought our treasure where we will,
> Then take we down his load, and turn him off,
> Like to the empty ass, to shake his ears,
> And graze in commons.

Whether after the ensuing war Antony, Octavius or another will or should become Cæsar need not here be considered; but in the meanwhile and perhaps thereafter science will suffer. The fundamental difficulty is that no method has been found for consulting the consensus of opinion of scientific men. An American university has an absentee board in nominal control and a president as benevolent despot; but there is a faculty, which after all is the real university. The Carnegie Institution has no similar body; and until it is formed, it will drift along without compass or rudder.

BOTANY IN THE PHILIPPINES.

WHATEVER opinion may be held in regard to the advantages or dangers connected with the acquirement of the Philippines by the United States, there is no doubt but that it will result in the extension of scientific knowledge. An Insular Bureau of Government Laboratories has been organized under the direction of Professor Paul C. Freer, of the University of Michigan, and a Bureau of Agriculture under the direction of Dr. F. Lamson-Scribner, of the U. S. Department of Agriculture, and scientific work is being done in other directions. The National Academy of Sciences last spring outlined, at the request of the President, a plan for a scientific survey of the islands, and this is being carried forward in all directions. The Bureau of Agriculture has already issued eight 'Farmers Bulletins' and four 'Scientific Bulletins,' the last of which, entitled 'Botan-

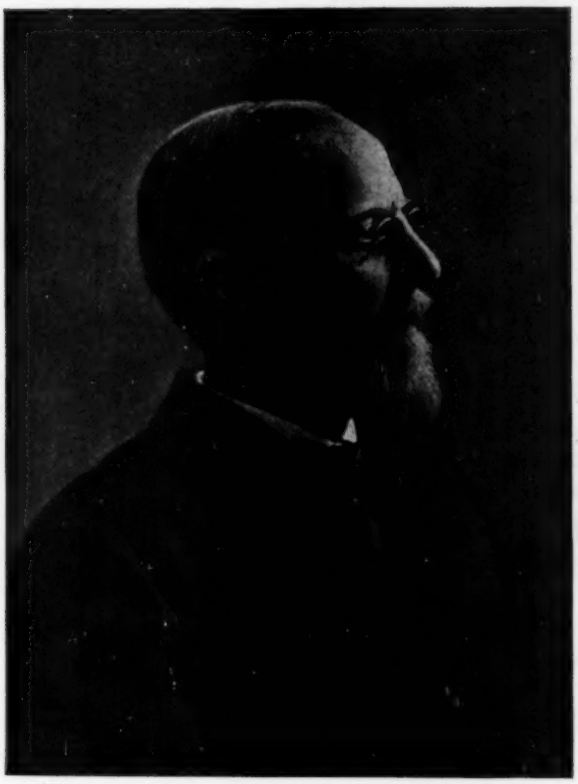


STATUE OF SEBASTIAN VIDAL IN THE BOTANICAL GARDENS IN MANILA.

ical Work in the Philippines,' by Mr. Elmer D. Merrill, gives an interesting account of the history of botany in the islands. Prior to the advent of the Americans, various travelers had made collections in the islands, and a certain amount of work had been accomplished by the priests; but the apathy of the Spanish government is in remarkable contrast to the present activity. The priests in the early centuries were chiefly interested in collecting medicinal plants, but Manuel Blanco published a flora of the Philippines extending to 887 pages in 1837, and a revised edition by Fernandez-Villar was published in Manila between 1877 and 1883. Blanco's original work is said to be very faulty, so that De Candolle regretted that he had not confined himself to writing sermons, and the later revision, prepared without reference to existing types or authentic botanical material, will retard rather than advance the science of botany.

In 1873 Domingo Vidal went to the islands and became director of the Botanical Garden, and after his death in 1878 he was succeeded by his brother Sebastian Vidal. The latter, who died in 1889 at the age of forty-seven years, appears to have been the ablest of Spanish botanists who have worked on the Philippine flora. He was greatly respected, both as a botanist and as a man, and a life-size statue, which is here reproduced, was erected by his friends in the center of the Botanical Garden.

The garden is said to have an unsatisfactory situation, being only a few feet above the level of the sea, with no



HENRY BARKER HILL.

protection from the fierce gales that sweep across the bay in the typhoon season, and it is now being developed as a park. It is to be hoped, however, that a botanical garden and experiment station will be established at a higher elevation. Since the organization of the Bureaus of Agriculture and Forestry last year, considerable progress has been made in the study of the botany of the islands, herbaria containing about 5,000 specimens having been made. The New York Botanical Garden has sent a special agent to the islands, and it is probable that more knowledge will be secured of the botany of the Philippines during the next ten years than during the preceding four hundred years of Spanish rule.

HENRY BARKER HILL.

WE reproduce above a portrait of Henry Baker Hill, whose death was a serious loss to Harvard University and the science of chemistry and who died at the comparatively early age of fifty-four years. Hill inherited his intellectual and academic interests, his father being president of Harvard University, and he early selected chemistry as his special field, his commencement oration being entitled 'The New Philosophy of Chemistry.' He was a student under and assistant to Professor Josiah P. Cooke, who first introduced laboratory methods of instruction, and when he himself became professor and director of the laboratory, he maintained its high traditions. Hill's research work was very special in character, being almost exclusively confined to the group of substances derived from furfurol; but the thoroughness and exactness of these investigations take high place as contributions to the development of organic chemistry.

SCIENTIFIC ITEMS.

WE regret to record the deaths, during the past month of Dr. H. Carrington Bolton, of Washington, well-known as a chemist and bibliographer; of Dr. Frank Russell, of Harvard University, a student of anthropology; of Dr. Cloudsley Rutter, of the Bureau of Fisheries; of Mr. Marcus Baker, of the U. S. Geological Survey and assistant secretary of the Carnegie Institution; of Professor Arthur Allin, head of the Department of Psychology and Education at the University of Colorado, and of Dr. George J. Engelmann, the eminent physician and gynecologist. THE POPULAR SCIENCE MONTHLY has very recently published contributions from Dr. Bolton, Dr. Engelmann and Dr. Rutter.

THE following is a list of those to whom the Royal Society has this year awarded medals: The Copley medal to Professor Eduard Suess for his eminent geological services, and especially for the original researches and conclusions published in his great work 'Das Antlitz der Erde.' A royal medal to Sir David Gill for his researches in solar and stellar parallax, and his energetic direction of the Royal Observatory at the Cape of Good Hope. A royal medal to Mr. Horace T. Brown for his work on the chemistry of the carbohydrates and on the assimilation of carbonic acid by green plants. The Davy medal to M. Pierre and Madame Curie for their researches on radium. The Hughes medal to Professor Wilhelm Hittorf for his long continued experimental researches on the electric discharge in liquids and gases.